Nokia Customer Care
NPL-4/5 Series Transceivers

Service Software Instructions

Issue 1 05/04
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Service Software

Overview

The following steps will be required to use service software with NPL-4/5.

- Install Phoenix Service Software.
- Install data package for NPL-4/5 for your region.
- FPS-8 flash update.
- JBV-1 docking station SW update.

Phoenix

Phoenix is the new generation service software for reprogramming, testing and tuning the phone. It has been designed to meet the challenges in servicing modern cellular phone technology.

The Phoenix program has been built using component architecture. This means that the actual program is small and most of the program's functionality is divided into dynamically loaded modules (DLLs).

Supported operating systems

Windows 2000 and XP.

Hardware requirements for using Phoenix

Minimum:
Processor 300 MHz, RAM memory 64 MB, disk space 100 MB.

Recommended for Windows 2000:
Processor 700 MHz, RAM memory 256 MB, disk space 150 MB.

Introduction

This section briefly describes how to install the Phoenix software and includes some basic information on how to use the program. For more detailed information, please refer to Phoenix **Help** files. Each feature in Phoenix has its own Help function, which can be activated while running the program.

Press the *F1* key or the feature's Help button to activate a Help file.

Installing Phoenix

Phoenix Service Software **A13 2004.08.5.42 or later** required.

It is recommended to uninstall the previous NPL-4/5 Phoenix package before installing the new one. Do it as follows:

- Download the latest Phoenix release. Please contact your regional After Market Services point for information on where to download the latest release.

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Download and read the release notes which have useful information on the software version you are using.

- Download the latest data packages for the products you will be using.
- Before you start installing the program, check that the dongle is attached to the parallel port. Contact your supervisor in order to obtain a suitable dongle. Administrator rights are required in order to be able to install Phoenix.
- Install Phoenix by executing the Phoenix installation package and follow the instructions on the screen.
  Initially, the setup files are extracted into the file system.

  Note: If the setup files are already extracted (left in the file system from previous installation) the "Overwrite Protection" dialog appears. Always click **"Yes to All"** to overwrite the existing setup files.

The installation checks that the latest supported dongle driver version is installed. The dongle driver is installed if there is no previous installation of the dongle driver or if the installed dongle driver is older than the latest supported version.

Note: If the dongle driver is installed during installation, you need to reboot your PC and restart the installation after reboot.

Program files are stored under *C:\Program Files\Nokia\Phoenix* (default).

If at any point during installation you get this message, Dongle is not found and installation can´t continue.

Possible reasons may be defective or too old PKD-1Dongle (five digit serial number Dongle when used with FPS-8 Prommer) or that the FLS-4S POS Flash Dongle is defective or power to it is not supplied by external charger.

Check the COM /parallel ports used first! After correcting the problem Installation can be restarted.

Dongle not found
Insert Nokia dongle and click Retry to re-detect the dongle or click Cancel to exit the installation.
Retry
Cancel

Uninstalling Phoenix

If you need to remove Phoenix Service Software from your computer:

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- Make sure that the dongle is attached.
- Go to the **Control Panel** and select **Add/Remove Programs**.
- Select **Phoenix Service software Axx 200x.xx.x.xx**.
- Click **Change/Remove** then **OK** to remove the application.

You may have to reboot your PC after uninstallation.

Data packages

The product data package contains all product specific data to make the Phoenix Service Software and tools usable with a certain phone model. Each product has its own data package (DP).

Data files are stored under *C:\Program Files\Nokia\Phoenix* **(default)**.

It also includes the latest version of the flash update package for FLS-4S* and FPS-8*.

Note! If you have different product packages installed, components are uninstalled only if they are not included in other product packages.

Before installation

- Check that the dongle is attached to the parallel port of your computer.
- Install Phoenix Service SW.
- Download the installation package (e.g. NPL-5_dp_EA_v_1_0.exe) to your computer (e.g. C:\TEMP).
- Close all other programs.
- Run the installation package (e.g. NPL-5_dp_EA_ v_1_0.exe) and follow the instructions on the screen.

If you already have the Phoenix Service SW installed on your computer, sooner or later there will be need to update it when new versions are released.

Please note that very often the Phoenix Service SW and the phone specific data package for Phoenix come in pairs, meaning that a certain version of Phoenix can only be used with a certain version of the data package. Always use the latest available versions of both. Instructions can be found in phone model specific Technical Bulletins.

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Data Package for Phoenix (Product Specific)

Before installation

Product Data Package contains all product specific data to make the Phoenix Service Software and tools usable with a certain phone model.

It also includes the latest version of flash update package for FLS-4* and FPS-8*/FPS-8C

- Check that the Dongle is attached to the parallel port of your computer.
- Install Phoenix Service SW
- Download the installation package (e.g. *NPL-4/5_dp_1.00.exe*) to your computer (e.g. C:\TEMP)
- Close all other programs
- Run the application file (e.g.*NPL-4/5_dp_1.00.exe*) and follow instructions on the screen

If you already have the Phoenix Service SW installed on your computer, sooner or later there will be need to update it when new versions are released.

Please note that very often the Phoenix Service SW and the Phone Specific Data Package for Phoenix come in pairs, meaning that certain version of Phoenix can only be used with certain version of Data Package. Always use the latest available versions of both. Instructions can be found in phone model specific Technical Bulletins.

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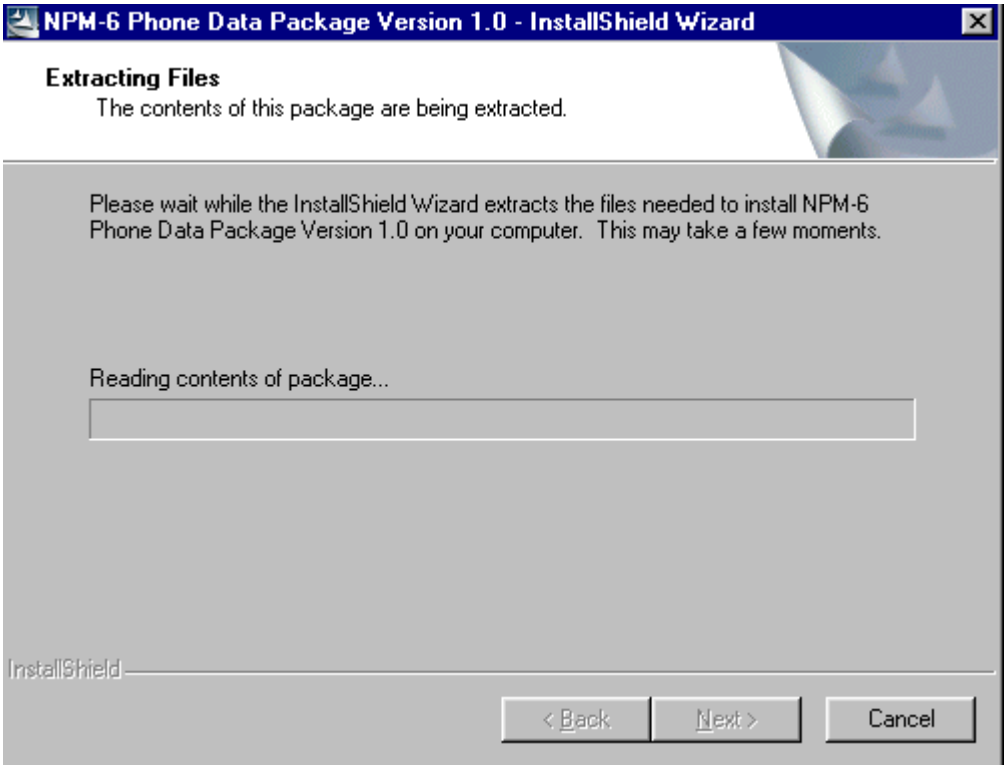
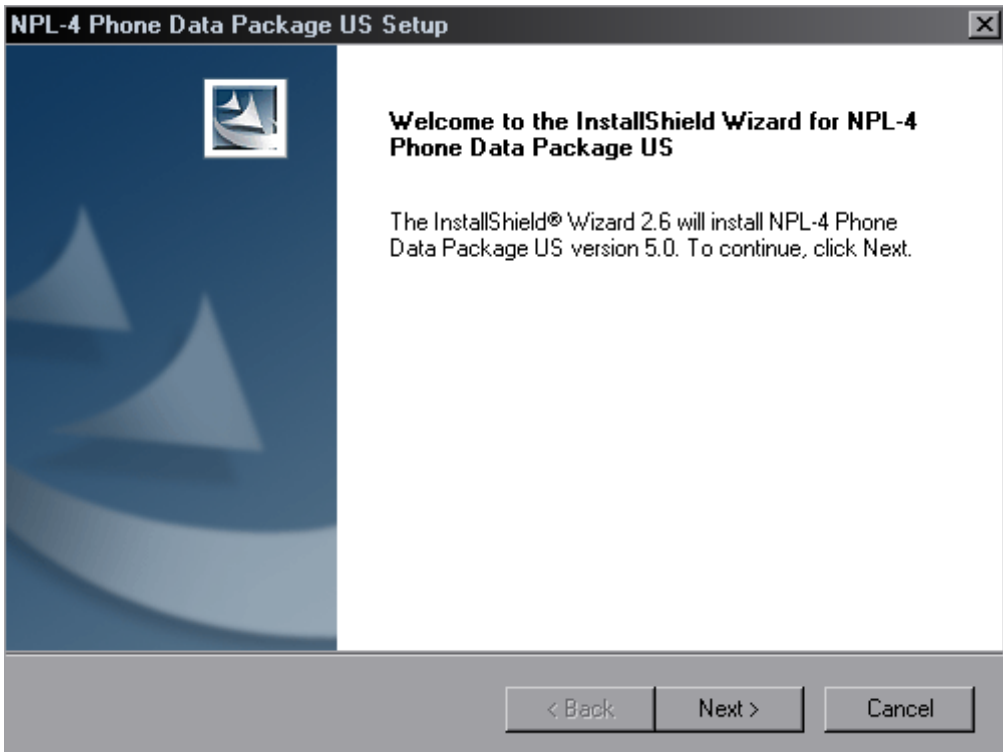
Installation of Phoenix data package (product specific)

Run the ***NPL-4/5_dp_v_1.00.exe*** to start installation.

When you choose "Next" the files needed for installation will be extracted. Please wait...


NPM-6 Phone Data Package Version 1.0 - InstallShield Wizard
Extracting Files
The contents of this package are being extracted.
Please wait while the InstallShield Wizard extracts the files needed to install NPM-6 Phone Data Package Version 1.0 on your computer. This may take a few moments.
Reading contents of package...
InstallShield
< Back
Next >
Cancel

Choose "Next" to continue.


NPL-4 Phone Data Package US Setup
Welcome to the InstallShield Wizard for NPL-4 Phone Data Package US
The InstallShield® Wizard 2.6 will install NPL-4 Phone Data Package US version 5.0. To continue, click Next.
< Back
Next >
Cancel

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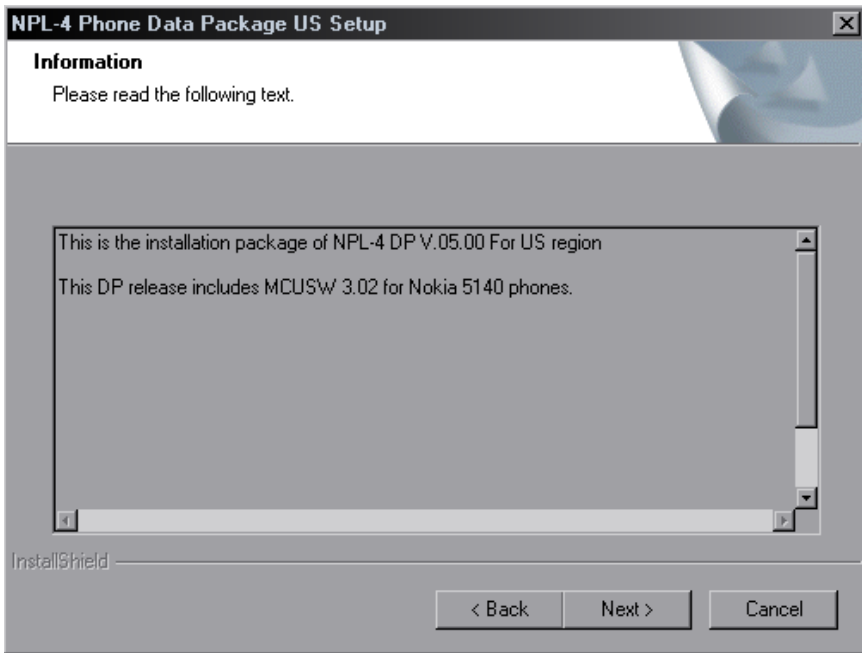
From this view you can see the contents of the Data Package.

Read the text carefully.

There should be information about the Phoenix version needed with this data package. Choose "Next".


NPL-4 Phone Data Package US Setup
Information
Please read the following text.
This is the installation package of NPL-4 DP V.05.00 For US region
This DP release includes MCUSW 3.02 for Nokia 5140 phones.
InstallShield
< Back
Next >
Cancel

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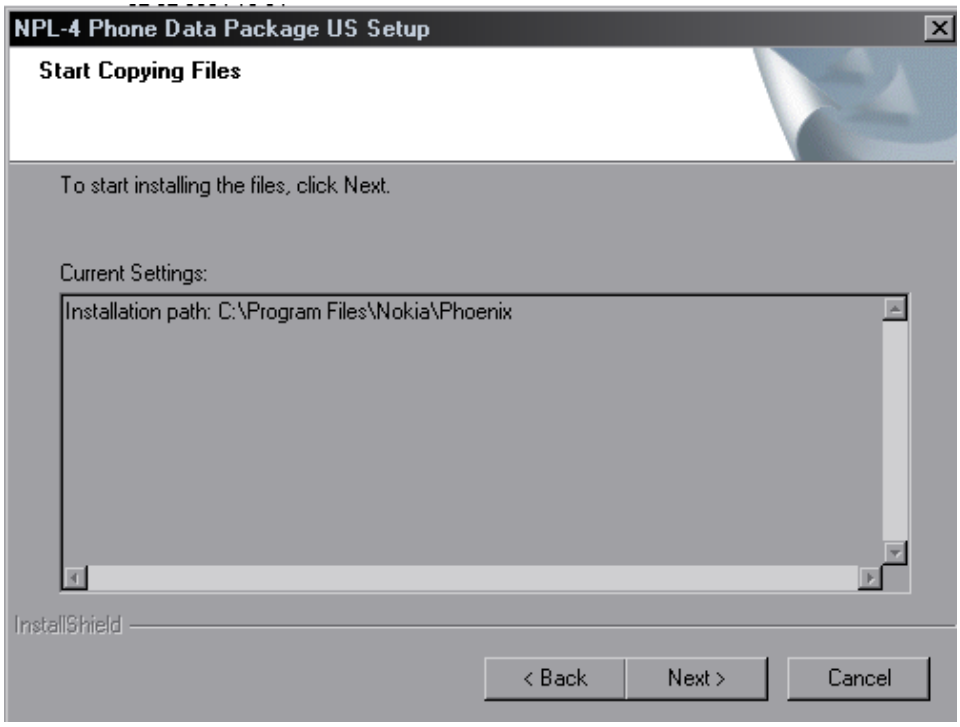
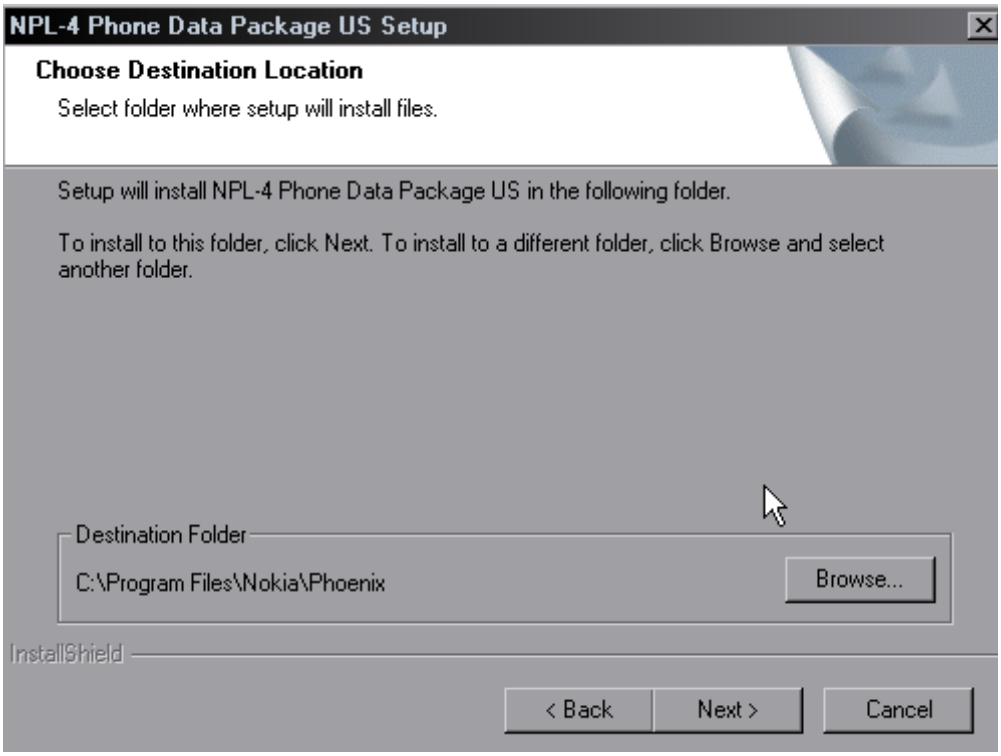
Install Shield checks where the Phoenix application is installed and the directory is shown. Choose “Next” to continue.



Confirm location and choose “Next” to continue.


NPL-4 Phone Data Package US Setup
Choose Destination Location
Select folder where setup will install files.
Setup will install NPL-4 Phone Data Package US in the following folder.
To install to this folder, click Next. To install to a different folder, click Browse and select another folder.
Destination Folder
C:\Program Files\Nokia\Phoenix
Browse...
InstallShield
< Back
Next >
Cancel

Phone model specific files will be installed. Please wait.

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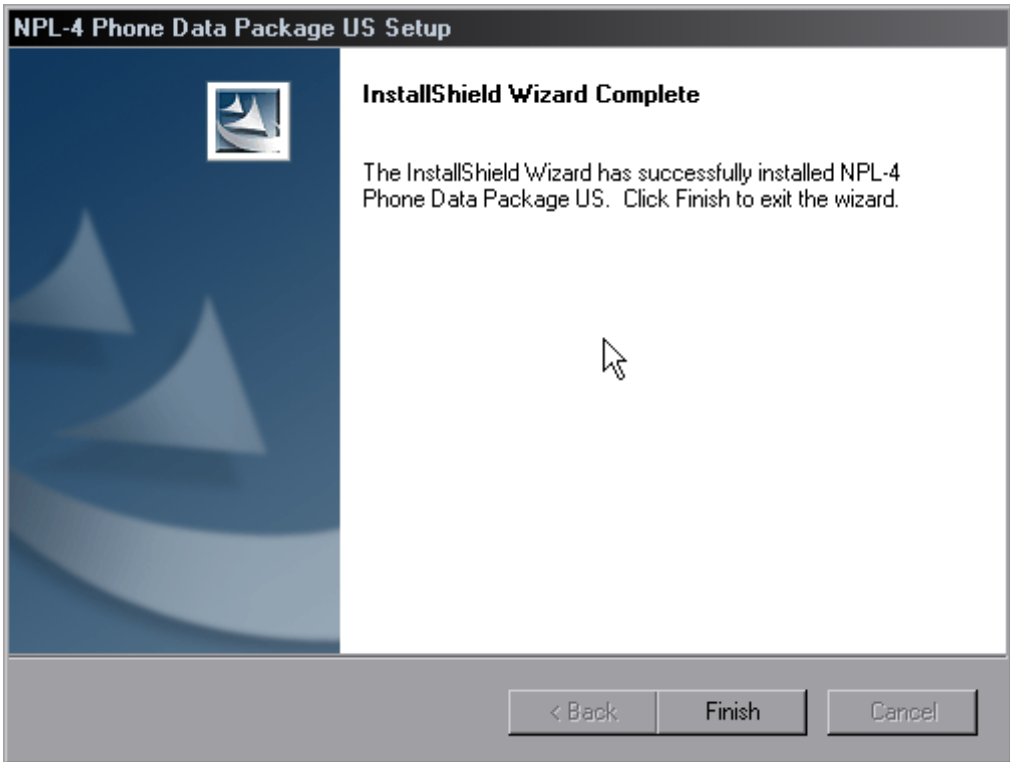
Choose "Finish" to complete installation.


NPL-4 Phone Data Package US Setup
InstallShield Wizard Complete
The InstallShield Wizard has successfully installed NPL-4 Phone Data Package US. Click Finish to exit the wizard.
< Back
Finish
Cancel

You now have all phone model specific files installed in your Phoenix Service SW.

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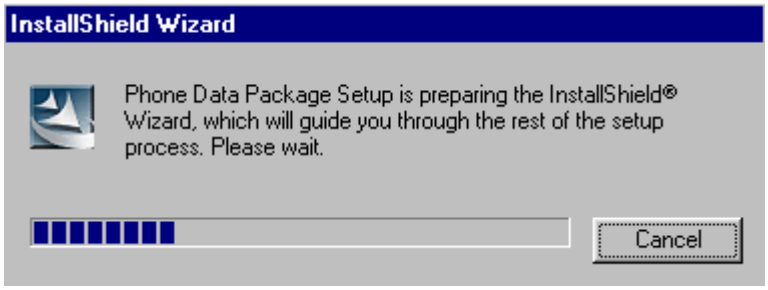
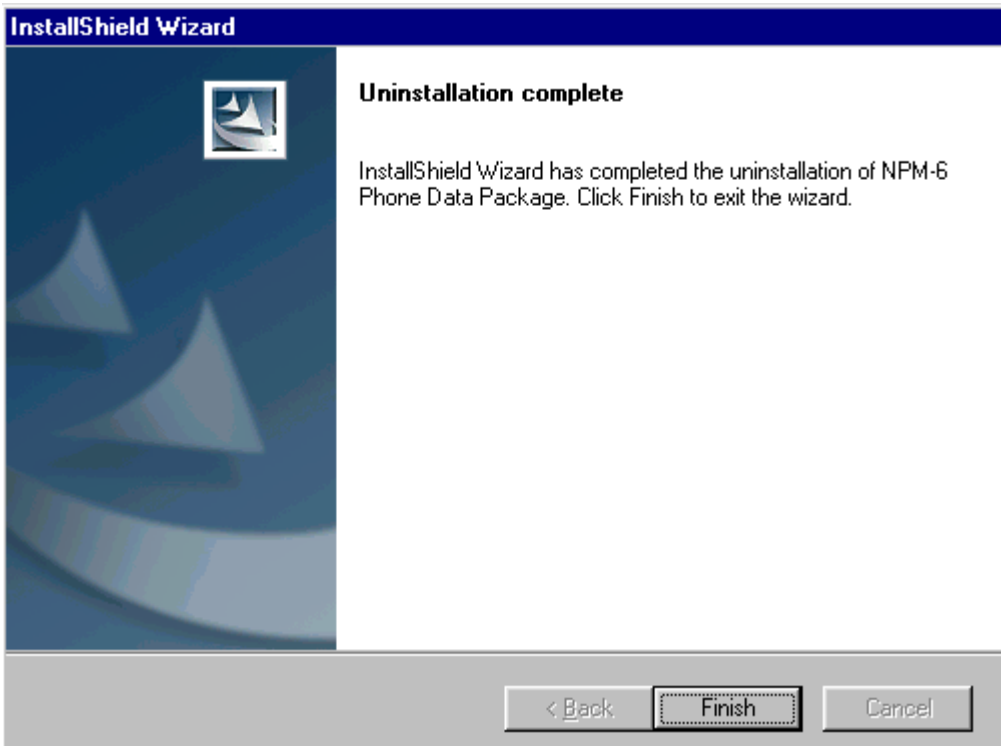
How to uninstall data package

Uninstallation can also be done manually from Windows Control Panel / Add / Remove Programs/ "NPL-4/5 Phone Data Package".

If you try to install the same version of Phoenix Data Package that you already have, you are asked if you want to uninstall the version you have on your PC. Answer "OK" to uninstall, "Cancel" if you don't want to uninstall. Older versions of data packages do not need to be uninstalled.


InstallShield Wizard
Phone Data Package Setup is preparing the InstallShield® Wizard, which will guide you through the rest of the setup process. Please wait.
Cancel

Once the previously installed Data package is uninstalled, choose "Finish".


InstallShield Wizard
Uninstallation complete
InstallShield Wizard has completed the uninstallation of NPM-6 Phone Data Package. Click Finish to exit the wizard.
< Back
Finish
Cancel

Run the ***NPL-4/5_dp_v_1.00.exe*** again to continue installation from the beginning.

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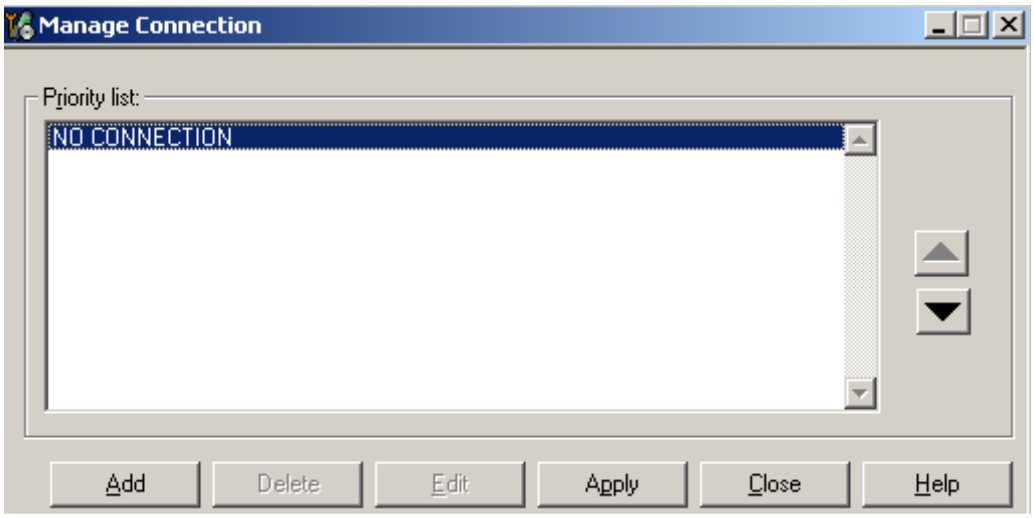
How to Manage Connections

Start Phoenix Service SW and Login.

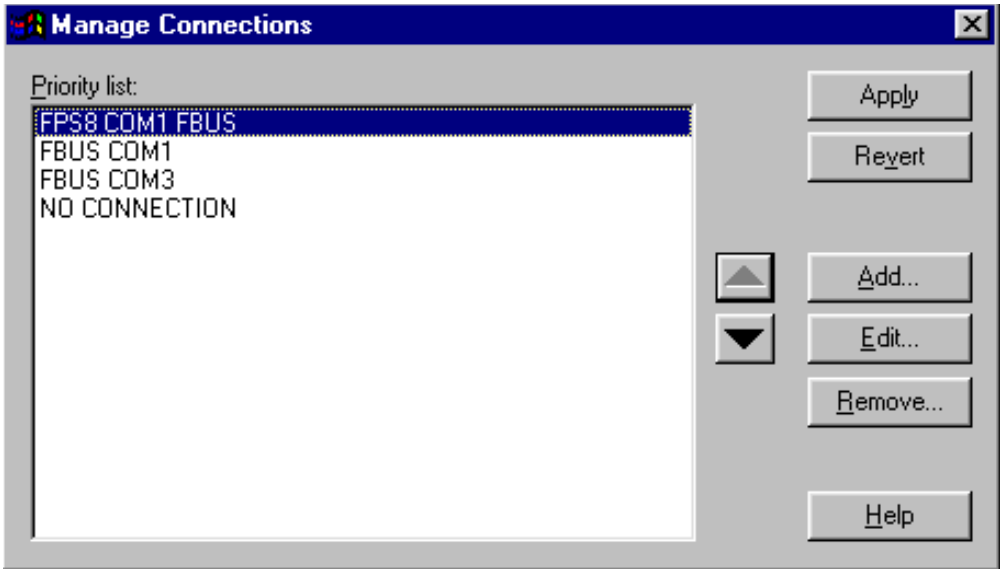
Choose "Manage Connections" From "File" – Menu



Existing connections can be selected, edited, deleted and new ones created by using this dialog.

A connection can be created either manually or by using a Connection Wizard.

To add new connection, choose "Add" and select if you want to create it manually or by using the Wizard.



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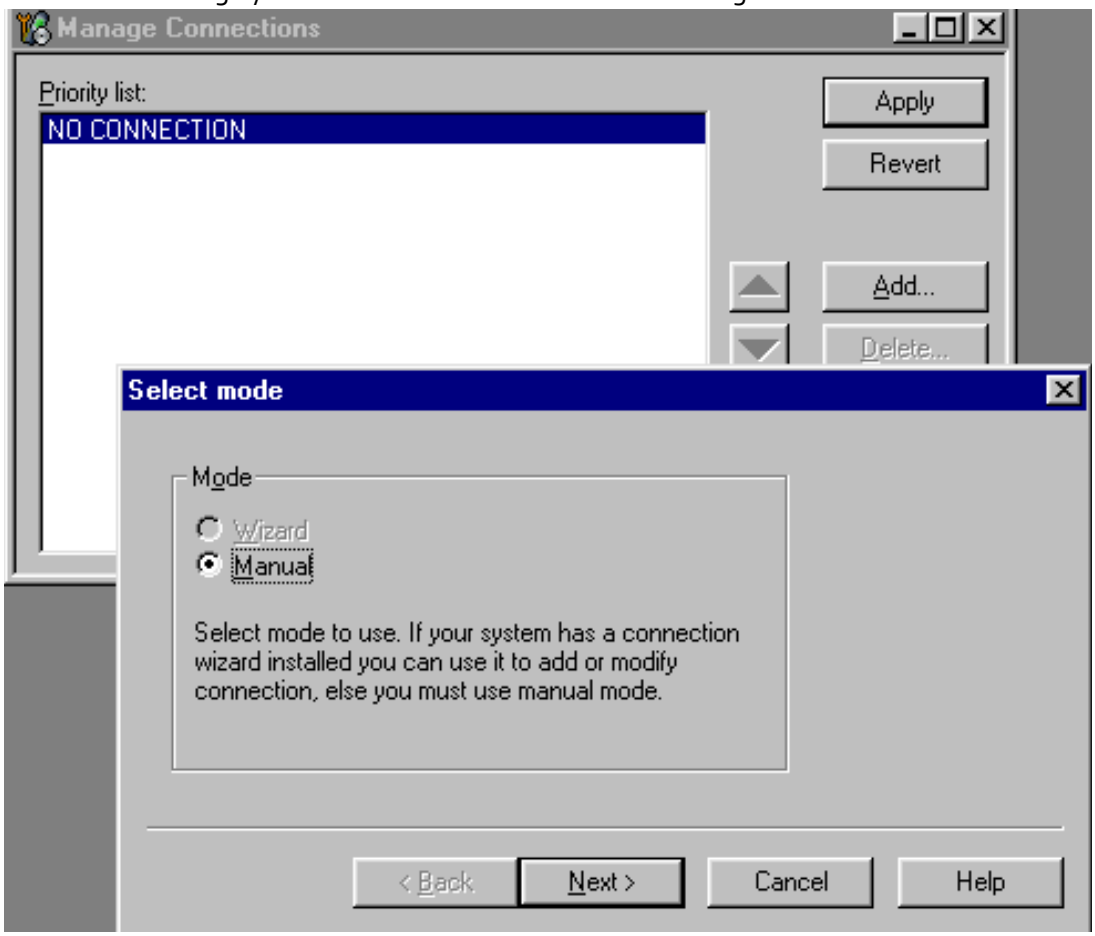
Choose "Next" to continue.

In the next dialogs you will be asked to select some settings for the connection



Manual Settings

A) For **FLS-4S POS Flash Device** choose following connection settings

Media: FBUS

COM Port: Virtual COM Port used by FLS-4 **Please check this always!**

(To check please go to Windows / Control Panel / FLS Virtual Port / Configuration)

B) For **FPS-8 Flash Prommer** choose following connection settings:

Media: FPS-8

Port Num: COM Port where FPS-8 is connected

COMBOX_DEF_MEDIA: FBUS

Choose "Finish" to complete.

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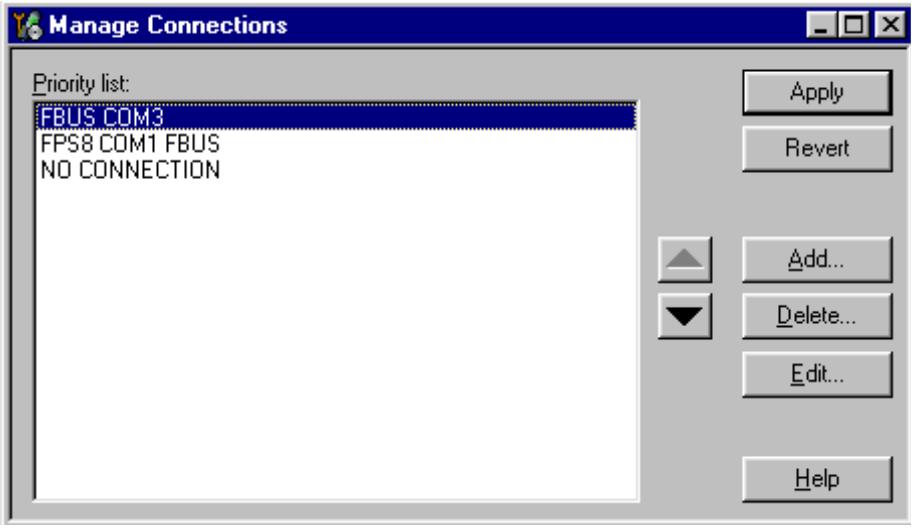
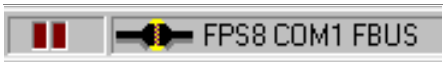
If you use the Wizard, connect the tools and a phone to your PC and the wizard will automatically try to configure the correct connection.

Activate the connection you want to use by clicking it and use up/down arrows to move it on top of the list. Choose "Apply".

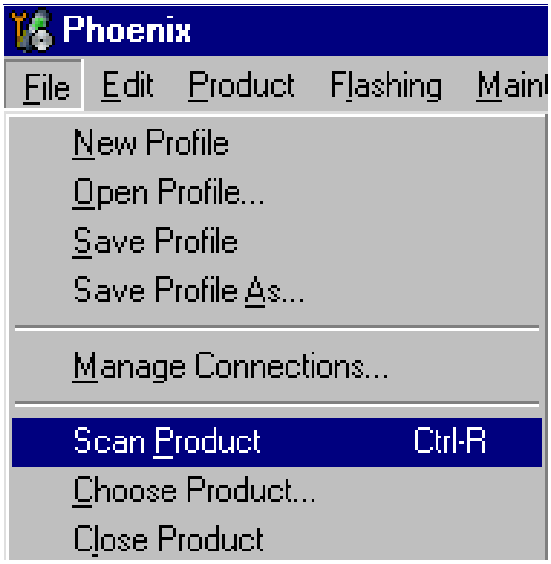
The connection is now selected and can be used after closing the "Manage Connections" window.



Selected connection will be shown on the right hand bottom corner of the screen.



To use the selected connection, connect the phone to Phoenix with correct service tools, make sure that it is switched on and select "Scan Product".



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When the Product is found, Phoenix will load product support and when everything is ready, name of the loaded product support module and its version will be shown on the bottom of the screen.

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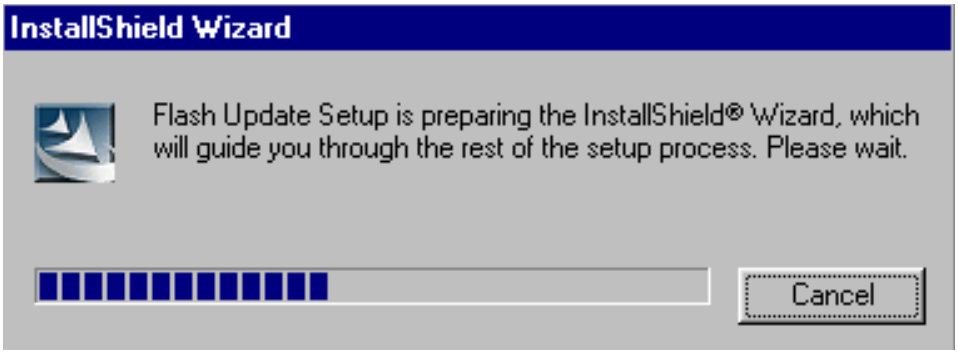
How to Update Flash Support Files for FPS-8*/FPS-8C and FLS-4*

Before installation

- Install Phoenix Service SW and Phoenix data package.
- Install the phone model Specific Datapackage for Phoenix
- The flash support files are delivered in the same installation package with Phoenix data package.
- Normally it is enough to install the data package only before updating the FPS-8.
- Separate installation package is for flash support files are available, and the files can be updated according to this instruction.

Installing the flash support files

Start by double clicking eg***. flash_update_02_10_00.exe.*** Installation begins.


InstallShield Wizard
Flash Update Setup is preparing the InstallShield® Wizard, which will guide you through the rest of the setup process. Please wait.
Cancel

If you already have the same Flash Update package files installed, you need to confirm if you want them to be reinstalled.

Uninstall Flash Update
Do you want to completely remove the Flash Update 02.10.000 application and all of its components?
OK
Cancel

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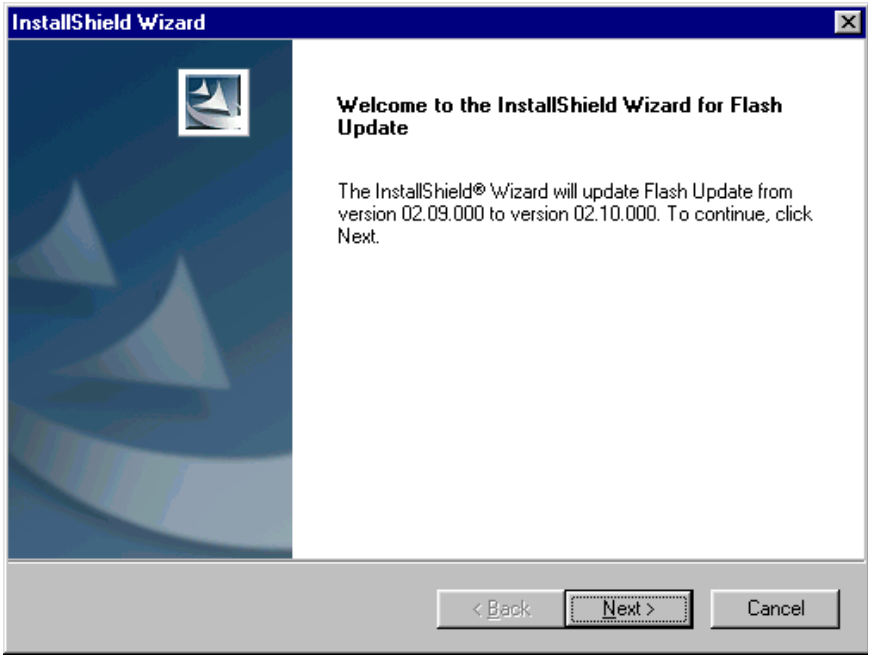
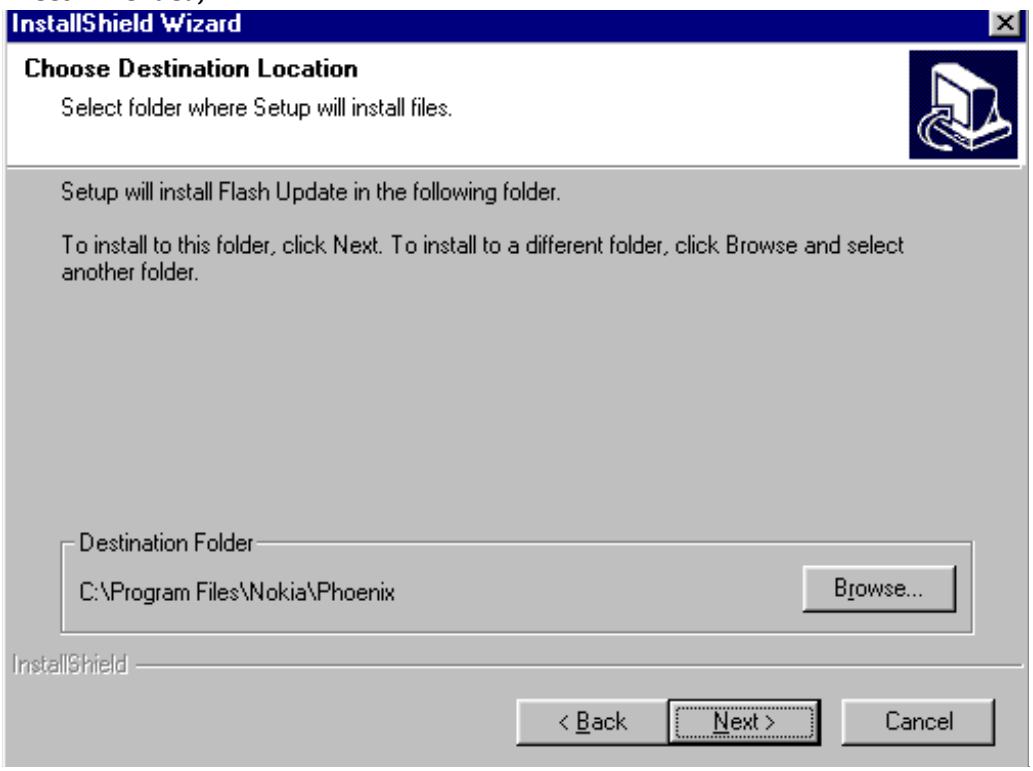
Choose "Next" to continue installation


InstallShield Wizard
Welcome to the InstallShield Wizard for Flash Update
The InstallShield® Wizard will update Flash Update from version 02.09.000 to version 02.10.000. To continue, click Next.
< Back
Next >
Cancel

It is **highly** recommended to install the files to the default destination folder ***C:|Program Files|Nokia|Phoenix***.

Choose "Next" to continue. You may choose another location by selecting "Browse" (not recommended).


InstallShield Wizard
Choose Destination Location
Select folder where Setup will install files.
Setup will install Flash Update in the following folder.
To install to this folder, click Next. To install to a different folder, click Browse and select another folder.
Destination Folder
C:\Program Files\Nokia\Phoenix
Browse...
InstallShield
< Back
Next >
Cancel

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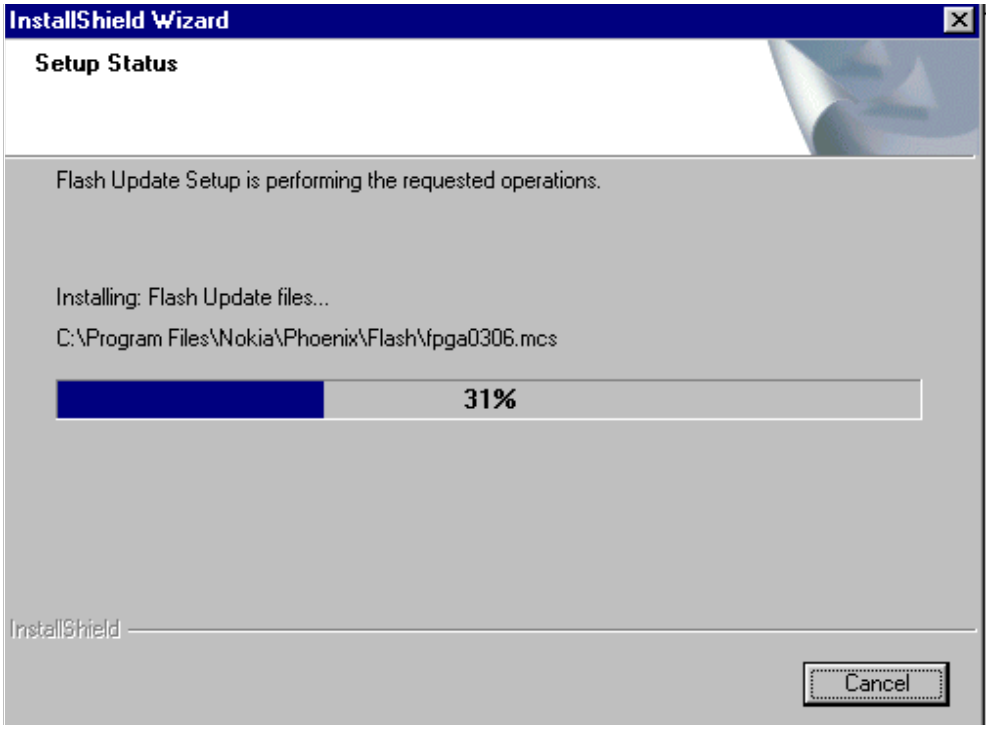
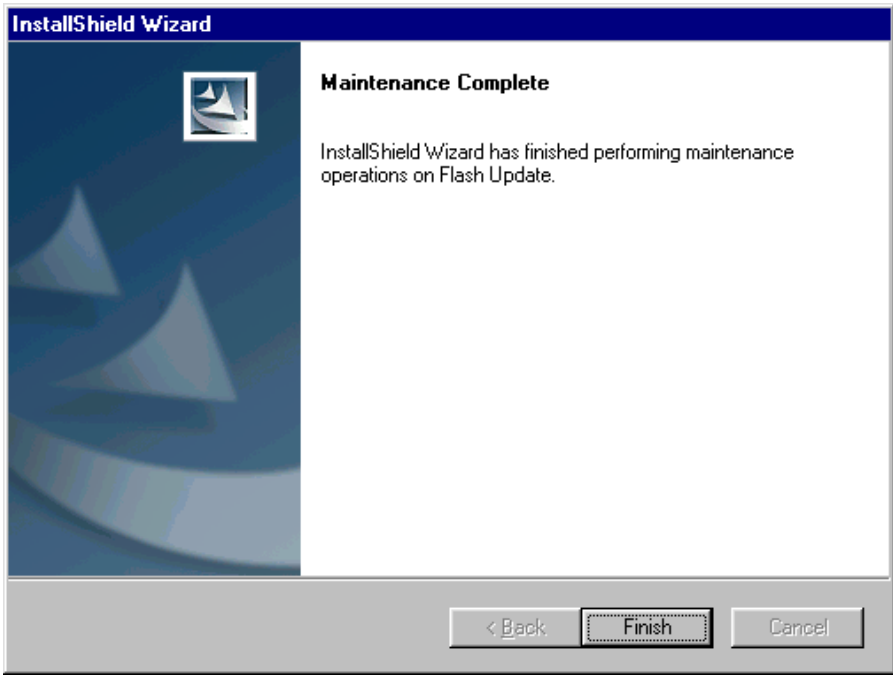
Installation continues...



Choose "Finish" to complete procedure.

- **FLS-4 can be used right after Flash Update Package is installed.**
- **FPS-8*/FPS-8C must be updated by using Phoenix!**



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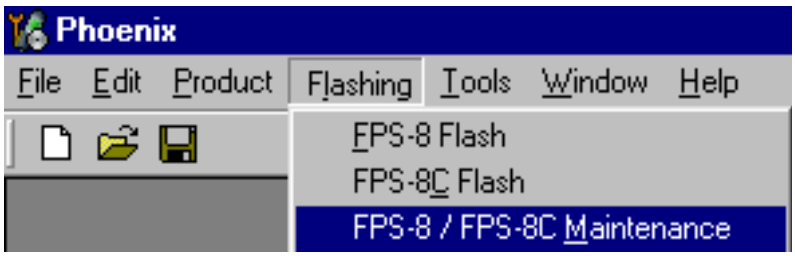
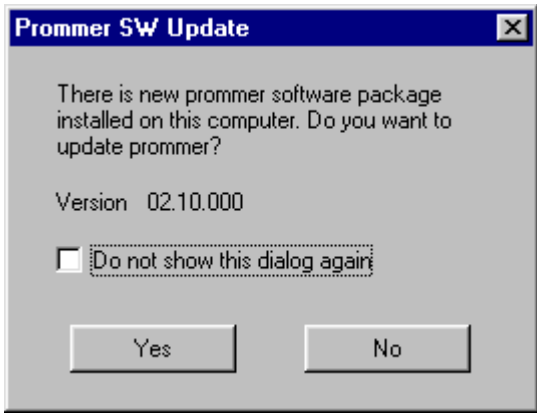
How to update the FPS-8*/FPS-8C Flash Prommer SW

Start Phoenix Service Software

Select"FPS-8 / FPS-8*/FPS-8C maintenance" from"Flashing" menu.



When new FPS-8 flash update package is installed to computer you will be asked to update the files to your FPS-8 Prommer. Select "Yes" to update files..


Prommer SW Update
There is new prommer software package installed on this computer. Do you want to update prommer?
Version 02.10.000
Do not show this dialog again
Yes
No

Update procedure takes a couple of minutes.

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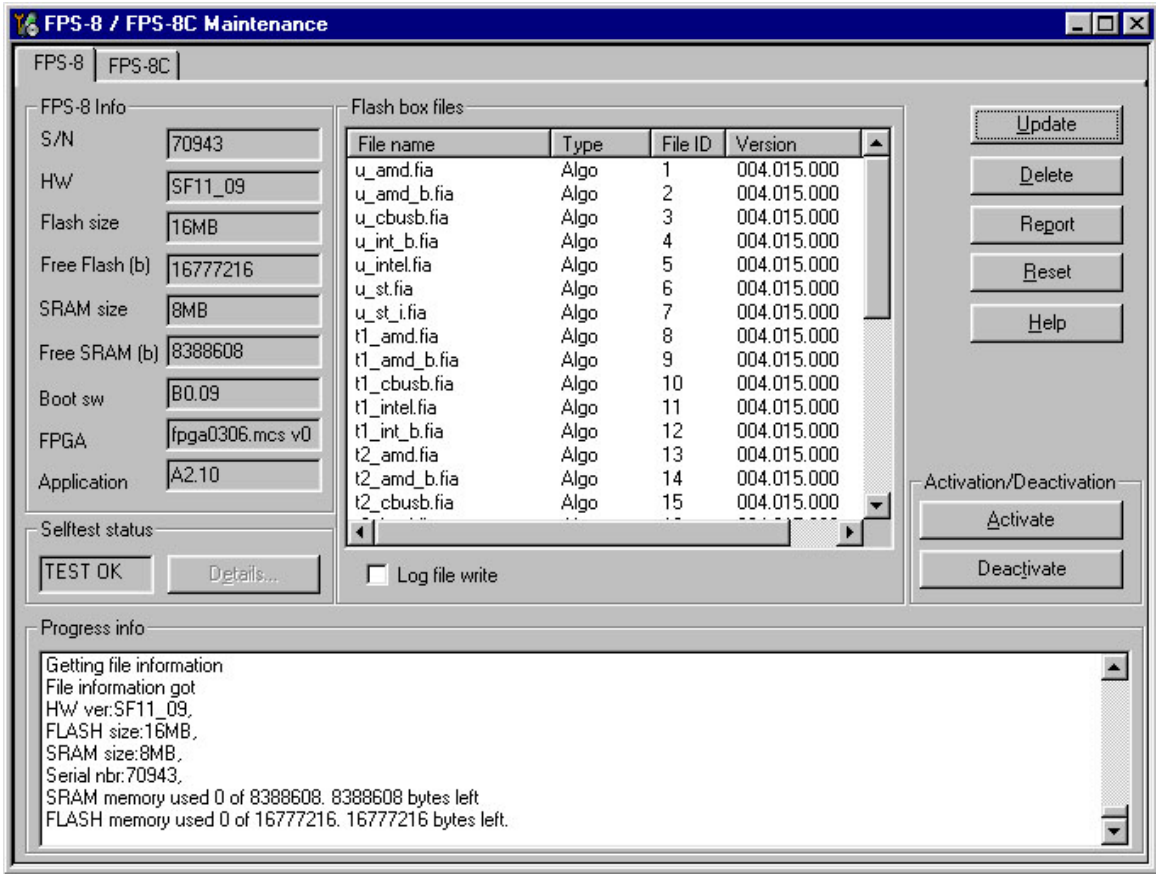
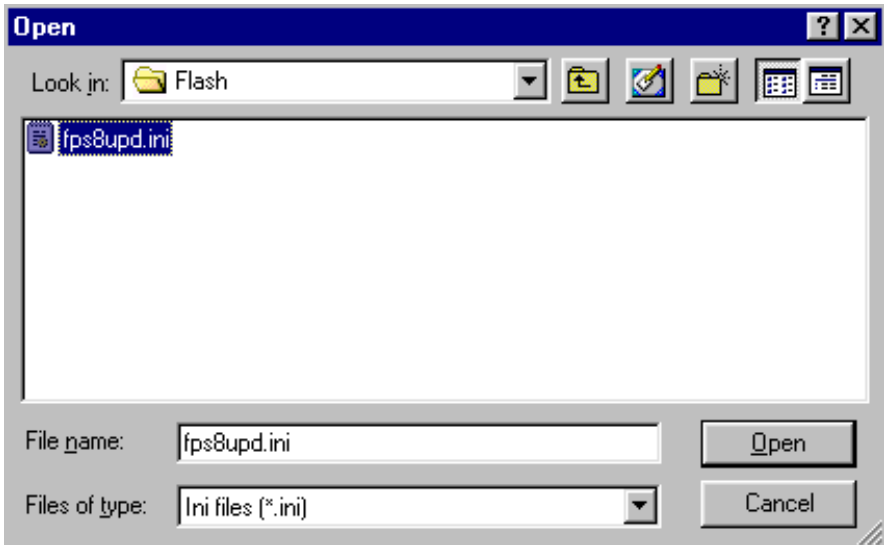


FPS-8 SW can also be updated by pressing "Update" button and selecting appropriate **fps8upd.ini** file under ***C:\Program Files\Nokia\Phoenix*\Flash** - directory



All files can be loaded separately to FPS-8. To do this, just press right mouse button in "Flash box files" window and select file type to be loaded.

More information and help can be found from the "Help" dialog.

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FPS-8 Activation and Deactivation

- Before the FPS-8 can be successfully used for phone programming, it must be first activated.
- If there is a need to send FPS-8 box to somewhere e.g. for repair, box must be first deactivated.

Activation

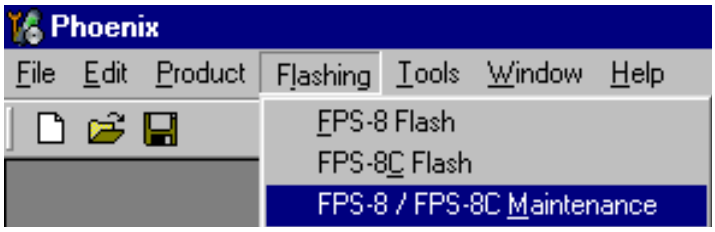
Before FPS-8 can be successfully used for phone programming, it must be first activated.

Fill in first "FPS-8 activation request" sheet, in the FPS-8 sales package and follow the instructions in the sheet.

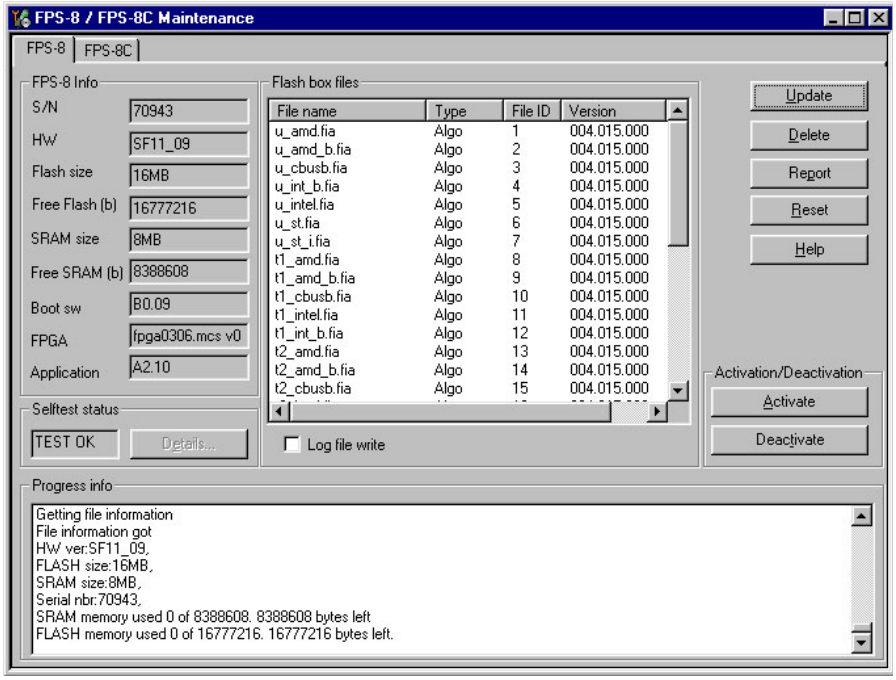
When activation file is received (e.g. 00000.in), copy it to ***C:\Program-Files\Nokia\Phoenix\BoxActivation -*** Directory on your computer (This directory is created when Phoenix is installed).

Start Phoenix Service Software.

Select "FPS-8 / FPS-8*/FPS-8C maintenance" from "Flashing" menu.



Select "Activate" from the "FPS8/8C Maintenance" – UI.



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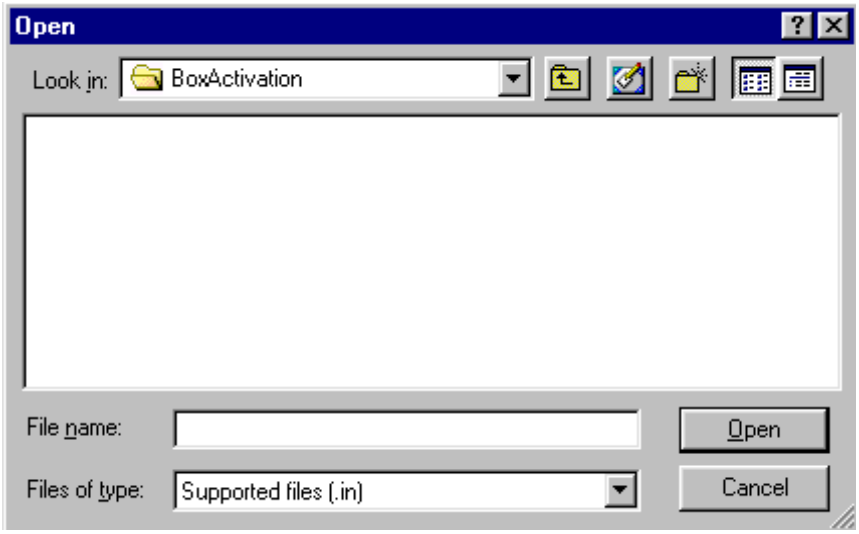
The activation file you saved to *C:\ProgramFiles\Nokia\Phoenix\BoxActivation* - directory will be shown (e.g. 00000.in), check that it is correct.



Box will be activated when you choose "Open"

Turn FPS-8 power off and on to complete activation

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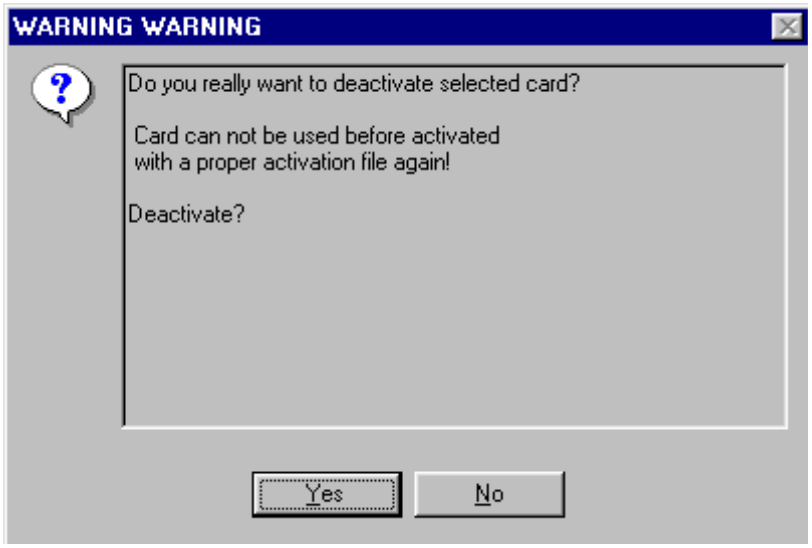
Deactivation

Start Phoenix Service Software.

Select "FPS-8 / FPS-8*/FPS-8C maintenance" from "Flashing" menu

Select "Deactivate" from the "FPS8/8C Maintenance" – UI.

Confirm Deactivation by choosing "Yes", Box will be deactivated.



Turn FPS-8 power off and on to complete deactivation.

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JBV-1 Docking Station SW

The JBV-1 Docking Station is a common tool for all DCT-4 generation products. In order to make the JBV-1 usable with different phone models, a phone specific Docking Station Adapter is used for different service functions.

The JBV-1 Docking Station contains Software (Firmware) which can be updated.

You need the following equipment to be able to update JBV-1 software:

- PC with USB connection
- Operating System supporting USB (Not Win 95 or NT)
- USB Cable (Can be purchased from shops or suppliers providing PC hardware and accessories)
- JBV-1 Docking Station
- External Power Supply 11-16V

Before installation

- Download *Jbv1_update.zip* – file to your computer (e.g. C:\TEMP) from your download web site.
- Close all other programs
- Follow instructions on the screen

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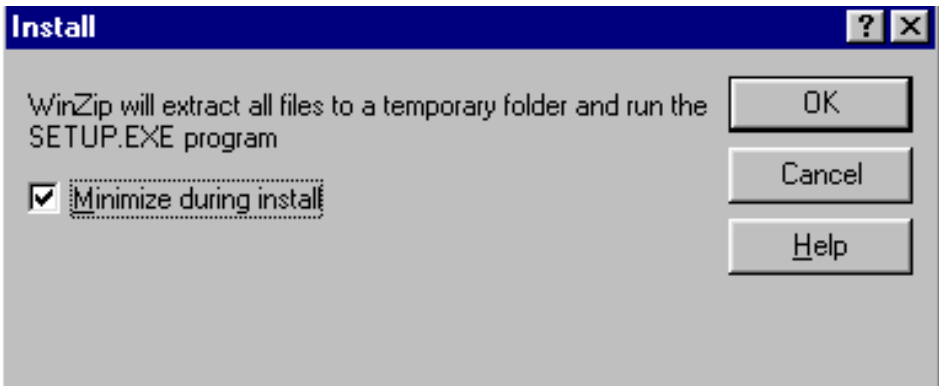
Installing SW needed for the JBV-1 SW update

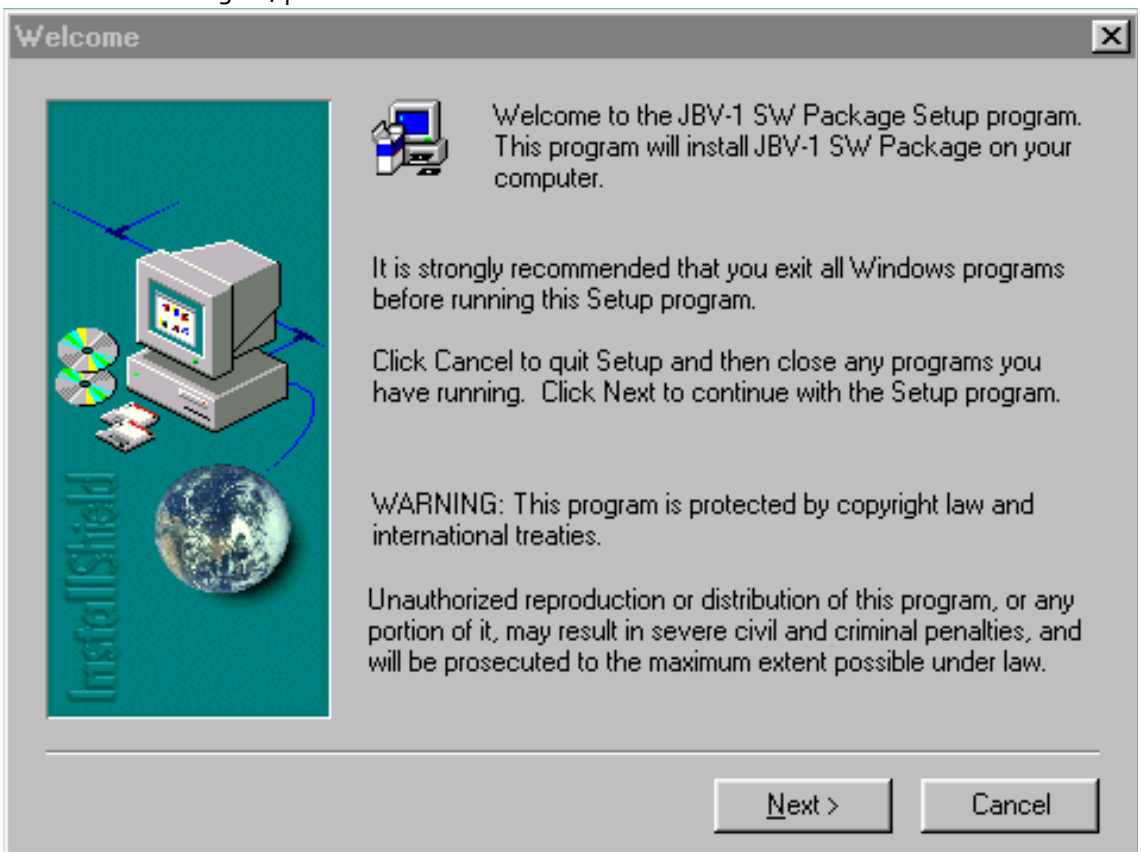
Note: DO NOT CONNECT THE USB CABLE / JBV-1 TO YOUR COMPUTER YET!

Run ***Jbv1_update.zip*** file and start SW Installation by double clicking ***Setup.exe***.

Files needed for JBV-1 Package Setup Program will be extracted.



Installation begins, please read the information shown and Choose "Next" to continue.


Welcome
Welcome to the JBV-1 SW Package Setup program. This program will install JBV-1 SW Package on your computer.
It is strongly recommended that you exit all Windows programs before running this Setup program.
Click Cancel to quit Setup and then close any programs you have running. Click Next to continue with the Setup program.
WARNING: This program is protected by copyright law and international treaties.
Unauthorized reproduction or distribution of this program, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under law.
InstallShield
Next >
Cancel

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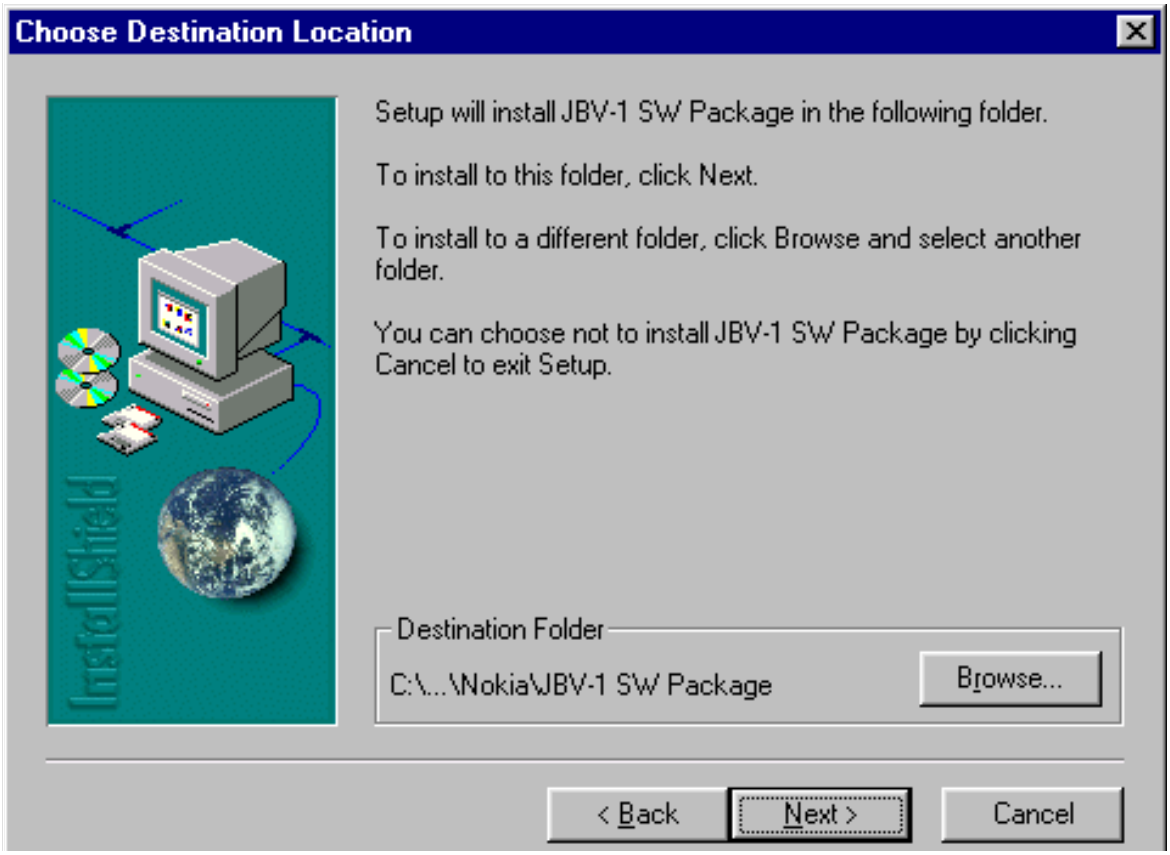
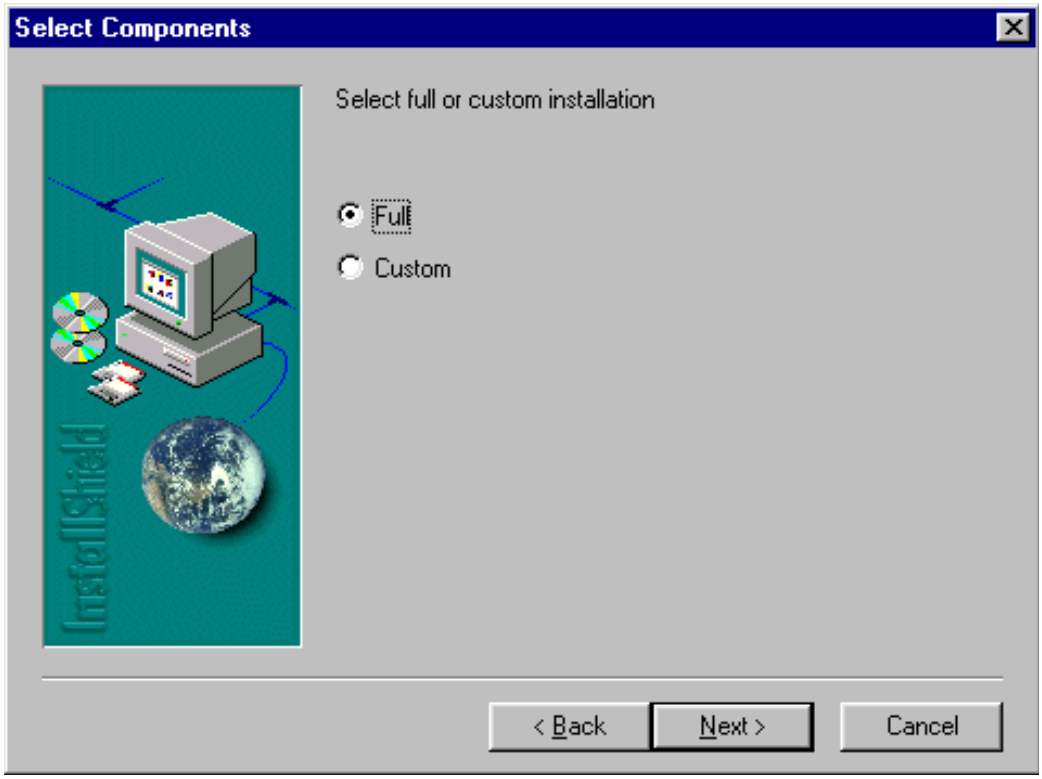
Use suggested destination folder where JBV-1 SW Package will be installed and choose "Next" to continue.


Choose Destination Location
Setup will install JBV-1 SW Package in the following folder.
To install to this folder, click Next.
To install to a different folder, click Browse and select another folder.
You can choose not to install JBV-1 SW Package by clicking Cancel to exit Setup.
Destination Folder
C:\...\Nokia\JBV-1 SW Package
Browse...
< Back
Next >
Cancel
InstallShield

Select "Full" Installation and choose "Next" to continue



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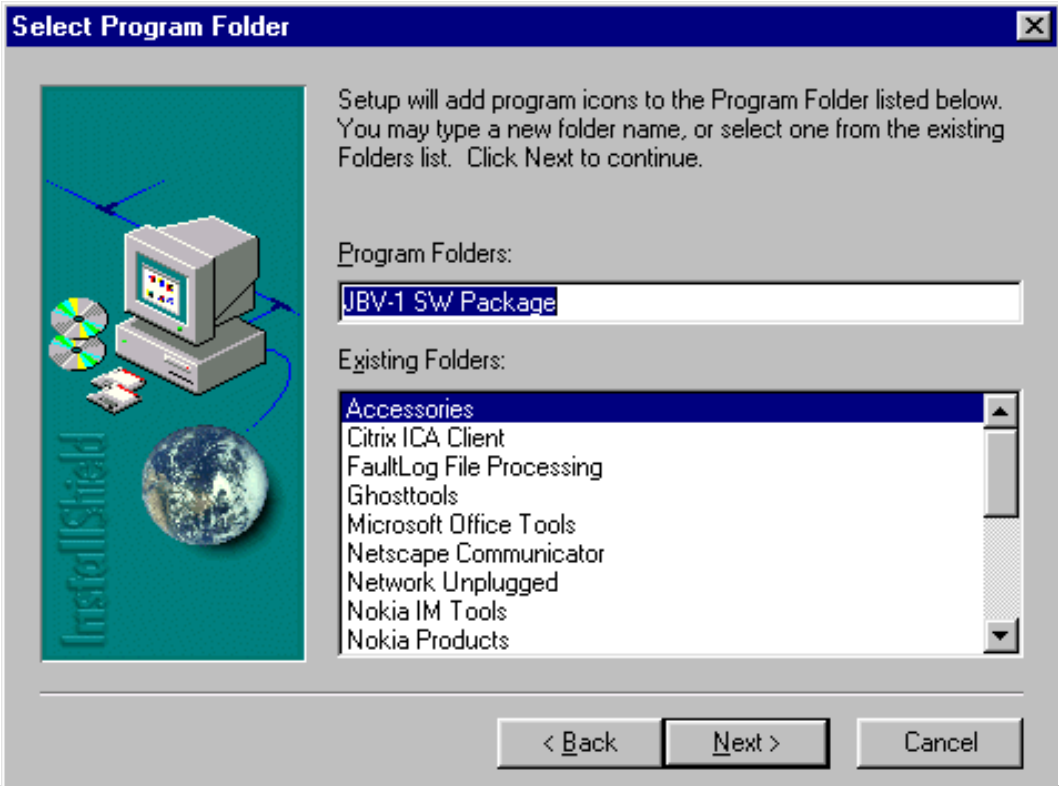
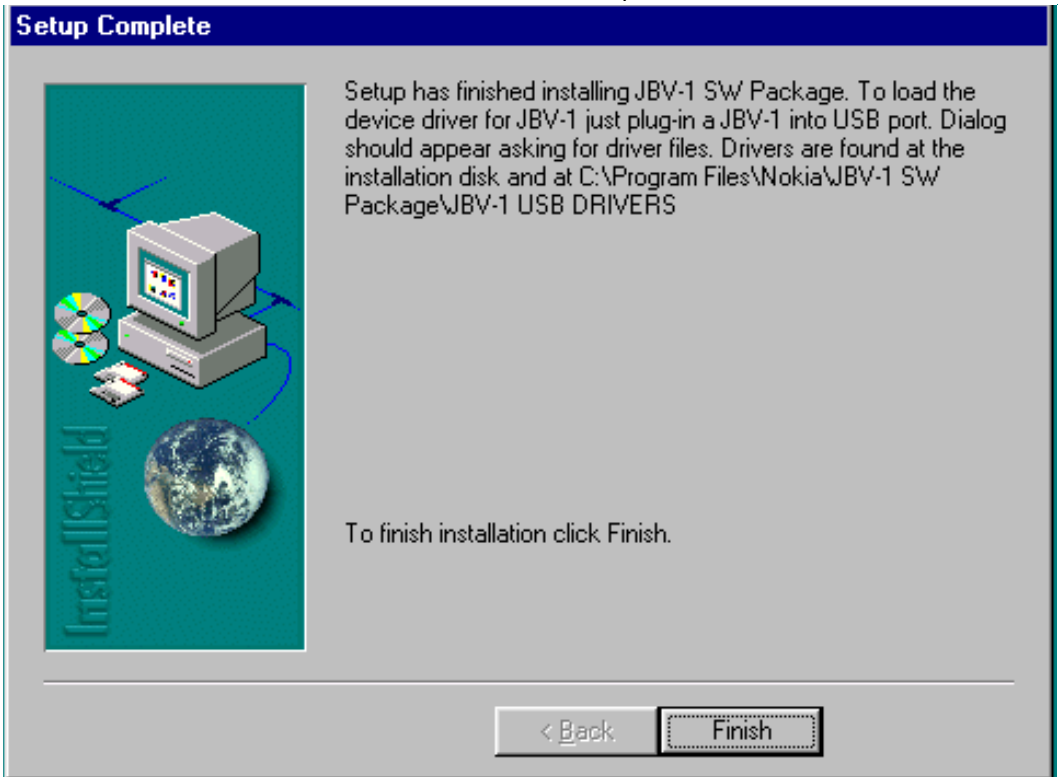
Program Folder will be created. Choose "Next" to continue, Software files will be installed.



After successful installation, choose "Finish" to complete.


Setup Complete
Setup has finished installing JBV-1 SW Package. To load the device driver for JBV-1 just plug-in a JBV-1 into USB port. Dialog should appear asking for driver files. Drivers are found at the installation disk and at C:\Program Files\Nokia\JBV-1 SW Package\JBV-1 USB DRIVERS
To finish installation click Finish.
InstallShield
< Back
Finish

NOW YOU CAN CONNECT THE USB CABLE / JBV-1 TO YOUR COMPUTER!

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Connect power to JBV-1 (11-16V DC) from external power supply, then connect USB Cable between JBV-1 USB connector and PC.

Windows will detect connected USB cable and detect drivers for new HW.

Follow the instructions and allow Windows to search and install the best drivers available. After this procedure the actual JBV-1 SW update can begin.

Add New Hardware Wizard
This wizard searches for new drivers for:
USB Device
A device driver is a software program that makes a hardware device work.
< Back
Next >
Cancel

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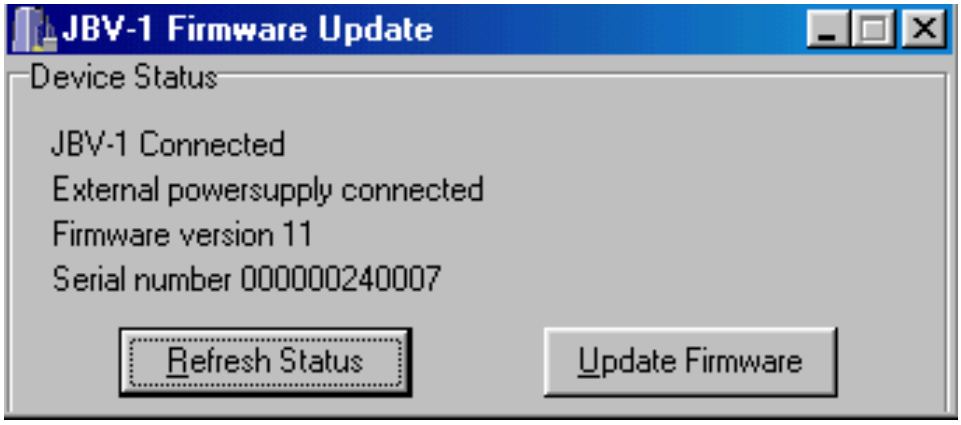
Updating the JBV-1 docking station software

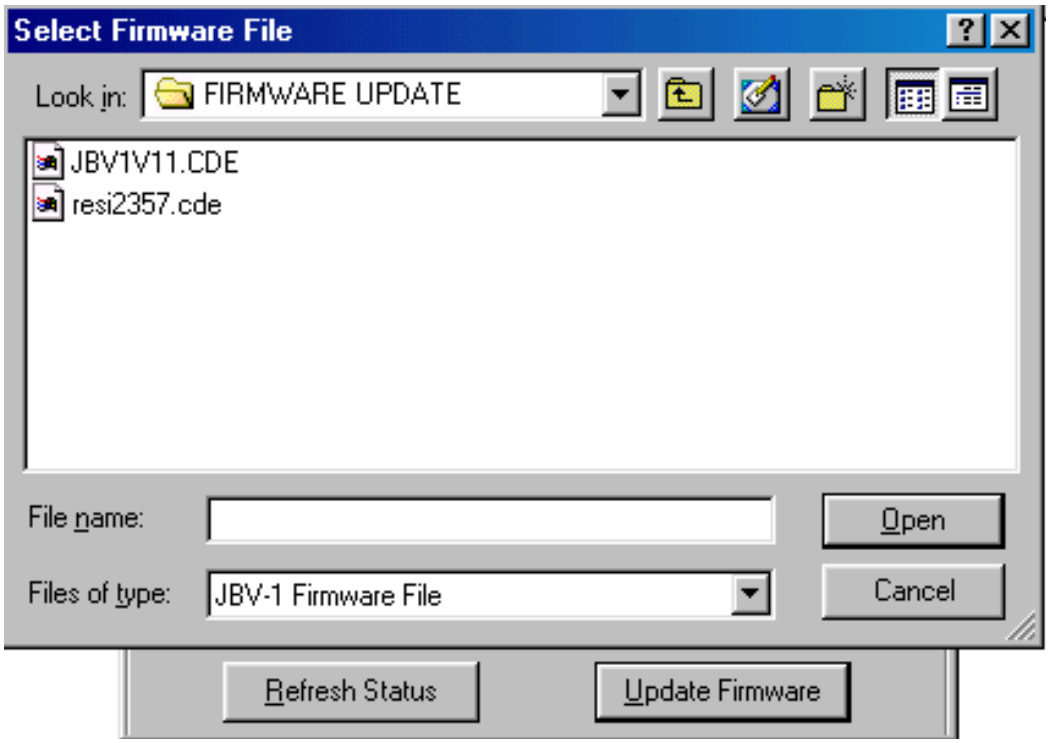
Go to folder *C:\Program Files\Nokia\ JBV-1 SW Package\ FIRMWARE UPDATE* and start JBV-1 Update SW by double clicking *fwup.exe.*

JBV-1 Firmware update starts and shows current status of the JBV-1 connected.

If firmware version read from your JBV-1 is not the latest one available, it needs to be updated by choosing "Update Firmware".



Choose file *JBV1v11.CDE* (example used here is for v 11) and "Open" to update your JBV-1.



After Successful update, current JBV-1 status will be shown. You have now updated the

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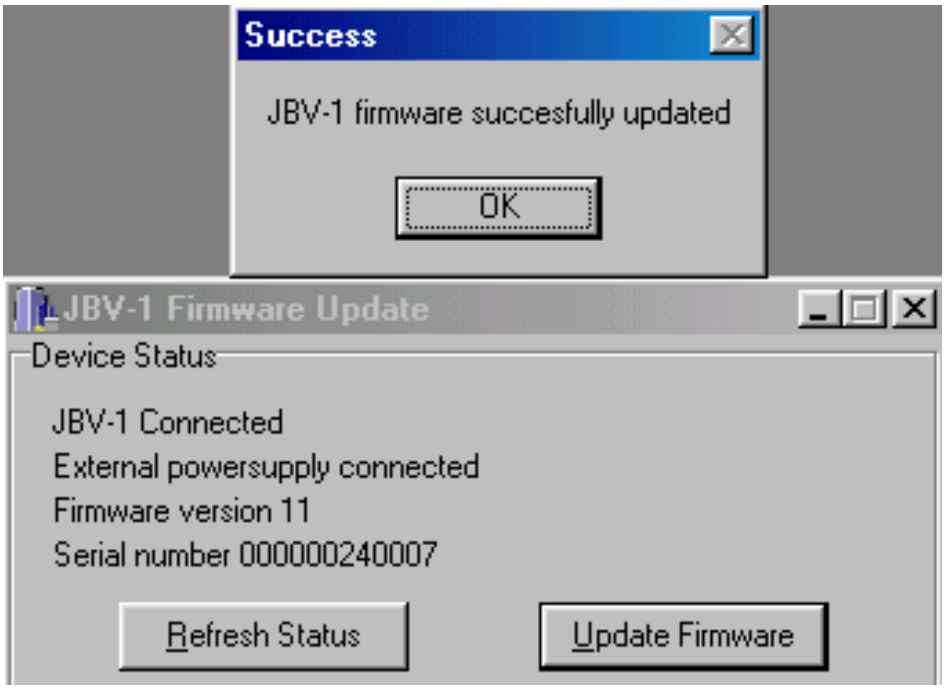
software of your JBV-1 docking station and it is ready for use.



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RF-tunings: Quick Guide for Tuning With Phoenix

General remarks

RF tunings must be performed in the same order as shown in this document. The order of the corresponding menu items in the Phoenix Service SW may be different.

If baseband tunings are needed, they should be completed before the RF tunings

Screen shots described in this document may change as the service software is developed.

Kindly refer to the Phoenix help files, the phone model specific service manual and bulletins for help.

Note! Avoid unnecessary tuning – factory-tuning values are always the most accurate ones.

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Service Tool Concept for RF Tuning Operations

General instructions for tuning:

Connect the phone to a PC, which has Phoenix Service Software and a dongle installed, using either

- Repair jig and DAU-9S (RS232) cable or
- DAU-9T cable (RS232) or
- DKU-5 cable (USB)

Connect the phone to a power supply (DC voltage of 4.0V, min. current of 3A) and switch the phone on.

- Start Phoenix Service Software and open FBUS connection.

- Select → Scan Product (Ctrl-R)

Wait until phone information is shown in the lower right corner of the screen.

- Set operating mode to “Local”.

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Figure 1: RF Tuning Setup

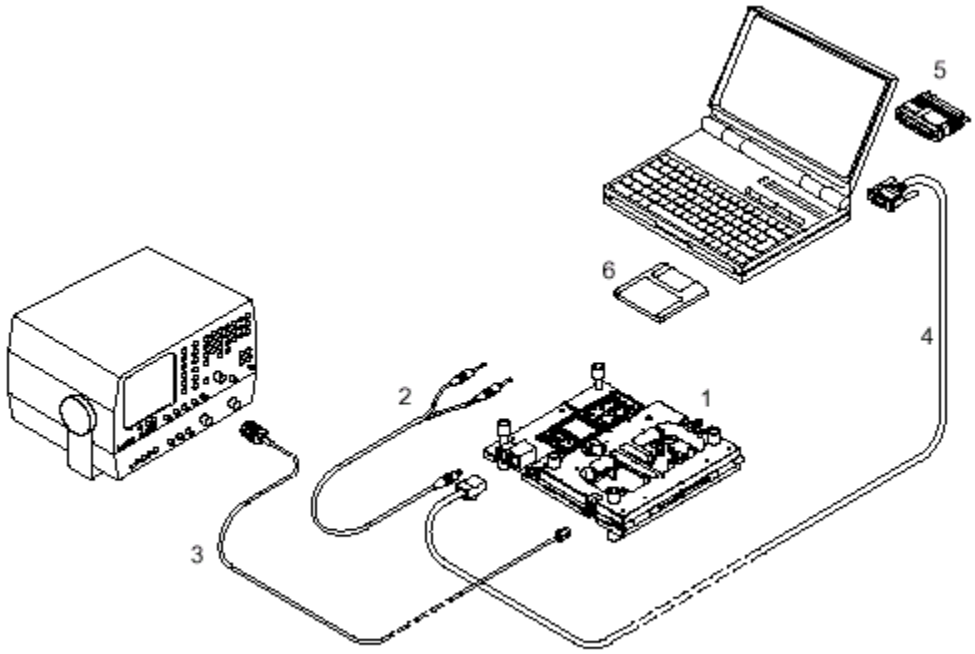

Figure 2: RF tuning setup

Item:	Type:	Service accessory:	Product code:
1	MJ-9	Module jig	0770707
2	PCS-1	DC power cable	0730012
3	XRF-1	RF antenna cable	0730085
4	DAU-9S OR	Service Mbus cable	0730138
	DAU-9T OR	Service Mbus cable	xxxxxxxx
	DKU-5	Service Mbus cable	xxxxxxxx
5	PKD-1	Software protection key	0750018
10		Phoenix Service SW	8409031
11	CD-ROM	Phoenix Service SW	0774286

RF Tuning after repairs

Following tunings have to be performed after repairs:

- Repairs in the TX part will require TX Power Level Tuning.
- When component replacements around the modulator area (RF path from UEM via RF ASIC to RF PA) have been done, TX IQ Tuning is

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additionally required.

- In general repairs in the RX front-end always require RX Calibration and Rx Band Filter Calibration for **all three bands**.

- Repairs in the PLL circuit always require RX Calibration of the low band.

If the RF ASIC was replaced all calibrations mentioned above have to be done.

Semi-automatic Calibrations & Measurements - step by step: RX/TX and GSM-Bands

RX tunings

The **RX Calibration** has to be performed to determine gains at different gain settings in the RF ASIC. The calibration must be done in **all three bands:**

- NPL-5:GSM900, GSM1800, GSM1900

- NPL-4:GSM850, GSM1800, GSM1900

RX Calibration requires an external RF signal generator. Most of the radio communication testers like CMD 55 or CMU 200 can be used also as RF signal generators, generating continuous RF signals (CW signal) with defined levels and frequencies.

Rx calibration GSM850 or GSM900

- NPL-5 (EU- variant) has to be calibrated on GSM 900.

- NPL-4 (US- variant) has to be calibrated on GSM 850.

Open the window "Rx Calibration" in Phoenix Service Software as follows:

- Select → Tuning (Alt-U)
- Select → Rx calibration (Alt-C)

The necessary band selection is made by Phoenix automatically in the low band.

- Connect an RF signal generator to the antenna port of the test jig respectively to the phone.

The setup should now look like this:

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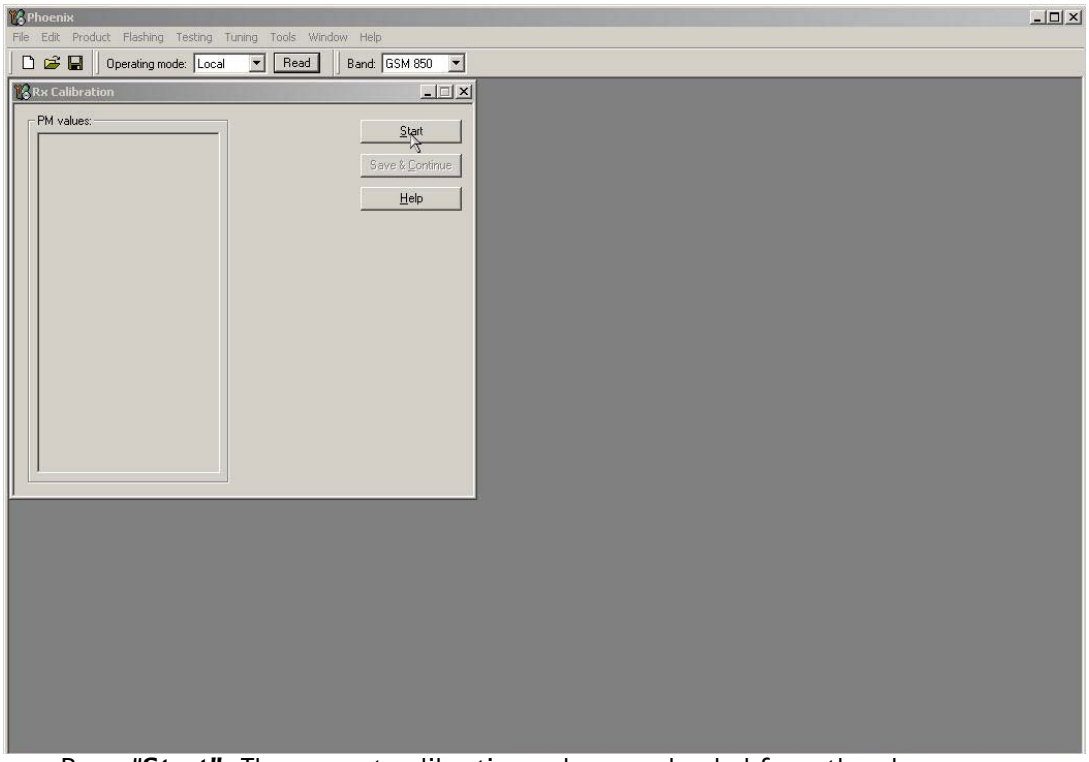
Figure 3: RX Calibration Setup



- Press **"Start":** The current calibration values are loaded from the phone memory and displayed in the window "PM values" and a window pops up, instructing you on frequency and power level tuning of the RF signal generator:

1) Power Level: -60 dBm

2) Frequency: 881.667110 MHz (GSM 850) or

942.467110 MHz (GSM 900)

- Compensate for external RF cable and test jig losses.

If a radio communication tester (CMD 55, CMU 200, HP 8960, MT 8801) is used, assure that "continuous mode" is switched on and "modulation" switched off.

- Press "OK" and the calibration will be executed.

- Press "Save and continue" to calibrate GSM1800 and GSM1900

Typical calibration values will look like this:

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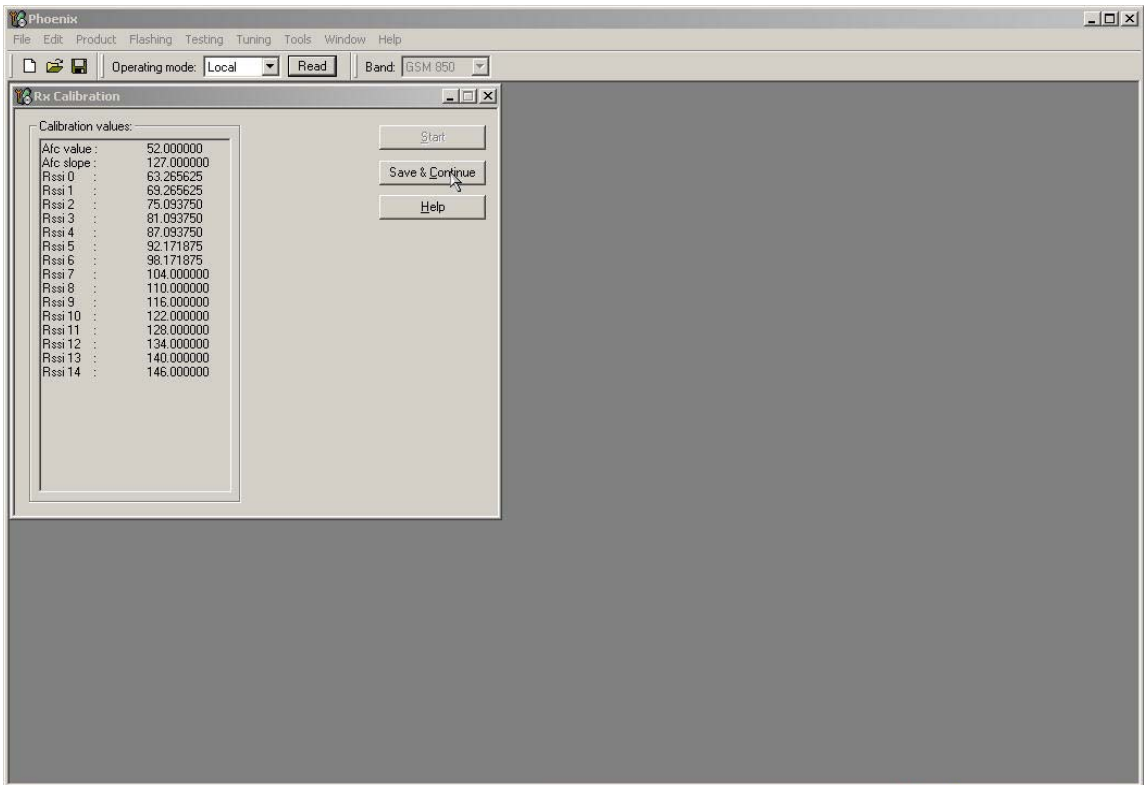
Figure 4: Calibration Values



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The results must fulfil the following limits:

Table 1: Calibration Values

Calibration value / Test case	Typical	Low limit	High limit
AFC value / check AFC_VALUE [DAC]	53	-350	+350
AFC Slope / check AFC_SLOPE [DAC]	128	90	165
Rssi 0 / Check RX GSM xxx Gain A 1 [dB]	65	59	71
Rssi 2 / Check RX GSM xxx Gain A 3 [dB]	77	71	83

Note! GSM xxx means the selected band: GSM 850 / 900 / 1800 / 1900

Rx calibration GSM1800 and GSM1900

Both bands are available in all variants of the triple band phones described herein. Thus, the calibration must **always be done for both bands**, GSM1800 and GSM1900.

- Connect an RF signal generator to the antenna port of the test jig respectively to the phone.

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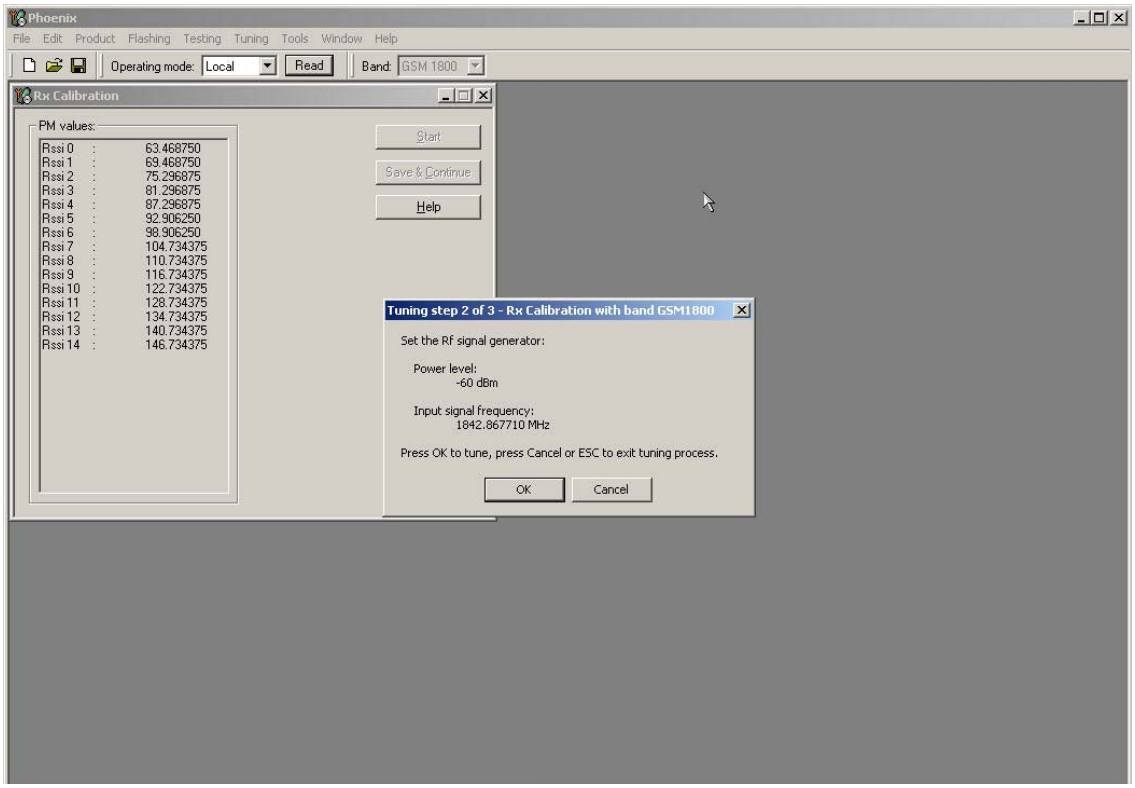
The setup should now look like this (GSM1800):

Figure 5: Calibration Mode



A window pops up, instructing you on frequency and power level tuning of RF signal generator:

1) Power Level: -60 dBm

2) Frequency: 1842.867110 MHz (GSM 1800)

- Compensate for external RF cable and test jig losses. If a radio communication tester (CMD55, CMU200, HP 8960, MT8801) is used, assure that "continuous mode" is switched on and "modulation" switched off.

- Press "OK" and the calibration will be executed.

- Press "Save and continue" to calibrate GSM1900

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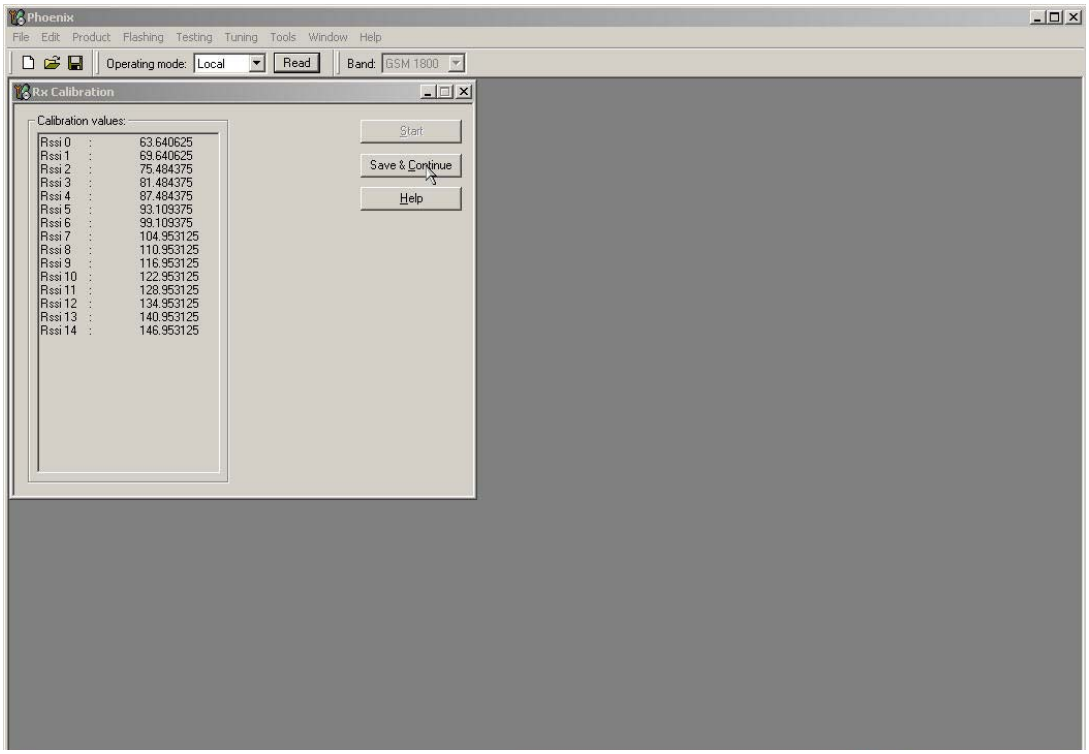
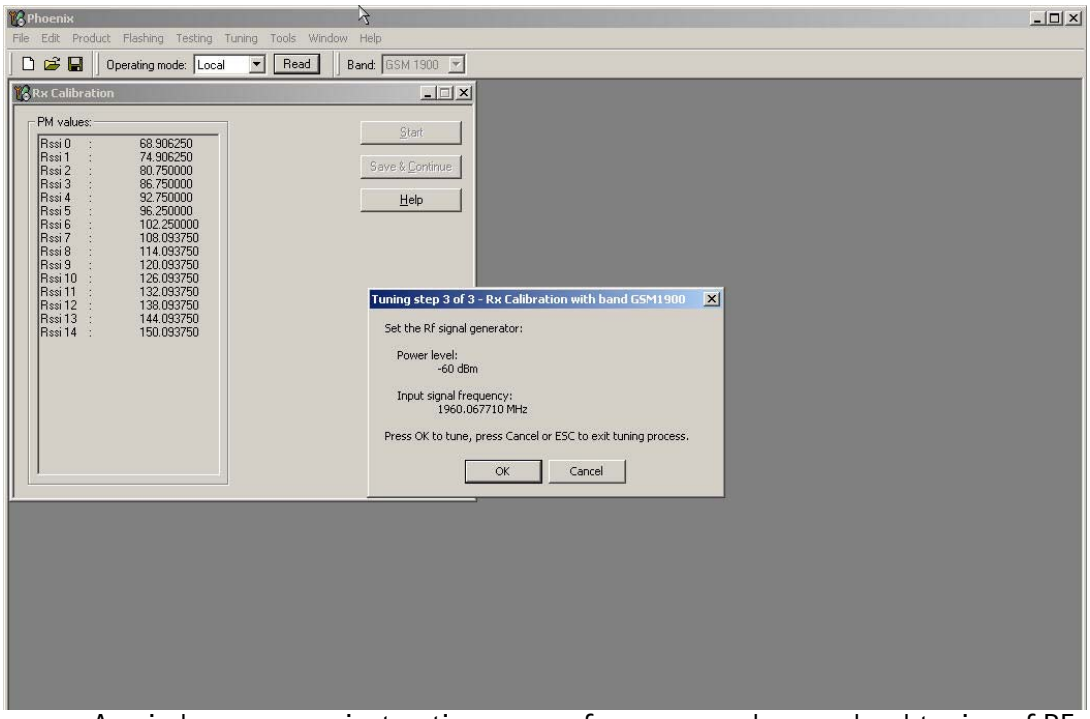
A typical result will look like this:

Figure 6: Calibration Execution



The setup should now look like this (GSM1900)

Figure 7: Calibration Execution



A window pops up, instructing you on frequency and power level tuning of RF signal generator:

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1) Power Level: -60 dBm

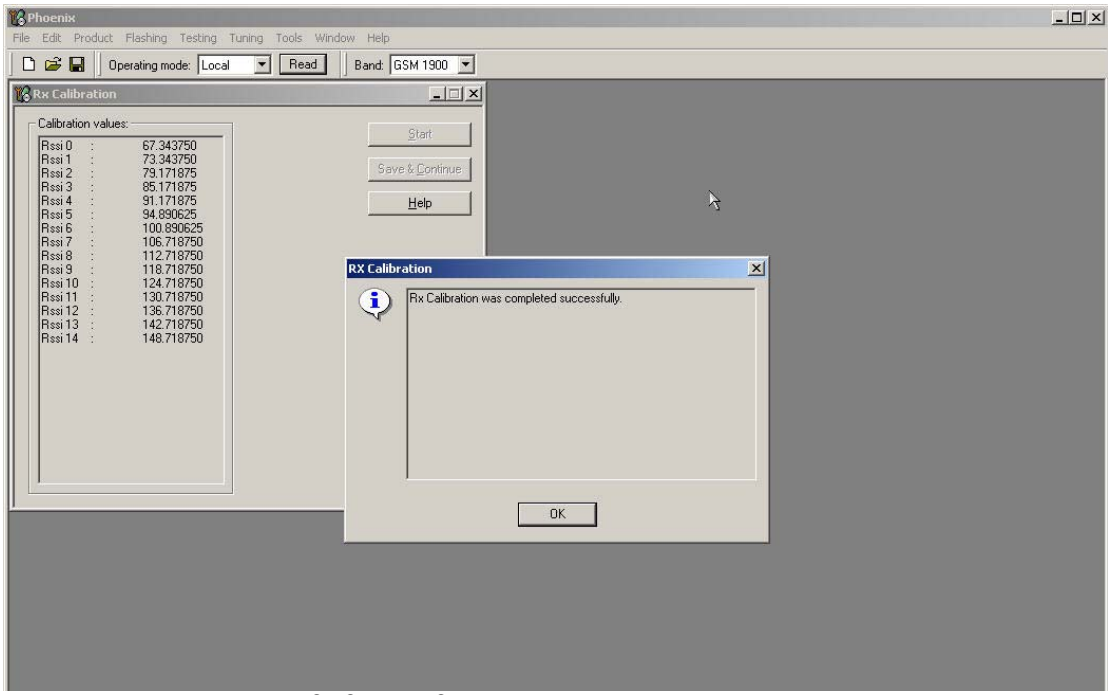
2) Frequency: 1960.067110 MHz (GSM 1800)

- Compensate for external RF cable and test jig losses. If a radio communication tester (CMD55, CMU200, HP 8960, MT8801) is used, assure that "continuous mode" is switched on and "modulation" switched off.

- Press "OK" and the calibration will be executed.

- Press "OK" to finish RX calibration.

Figure 8: Calibration Execution



The results must fulfill the following limits:

Table 2: Calibration Values

Calibration value / Test case	Typical	Low limit	High limit
Rssi 0 / Check RX GSM xxx Gain A 1 [dB]	65	59	71
Rssi 2 / Check RX GSM xxx Gain A 3 [dB]	77	71	83

Note! GSM xxx means the selected band: GSM 850 / 900 / 1800 / 1900

RX band filter response compensation

This alignment is necessary to compensate the frequency response of the RX band filters (SAW filters).

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Rx band filter response GSM850

The GSM850 chapters apply only for NPL-4 (US- variant).

Manual Tuning:

Open the window "Rx Band Filter Response Compensation" in Phoenix Service Software as follows:

- Select → Tuning (Alt-U)

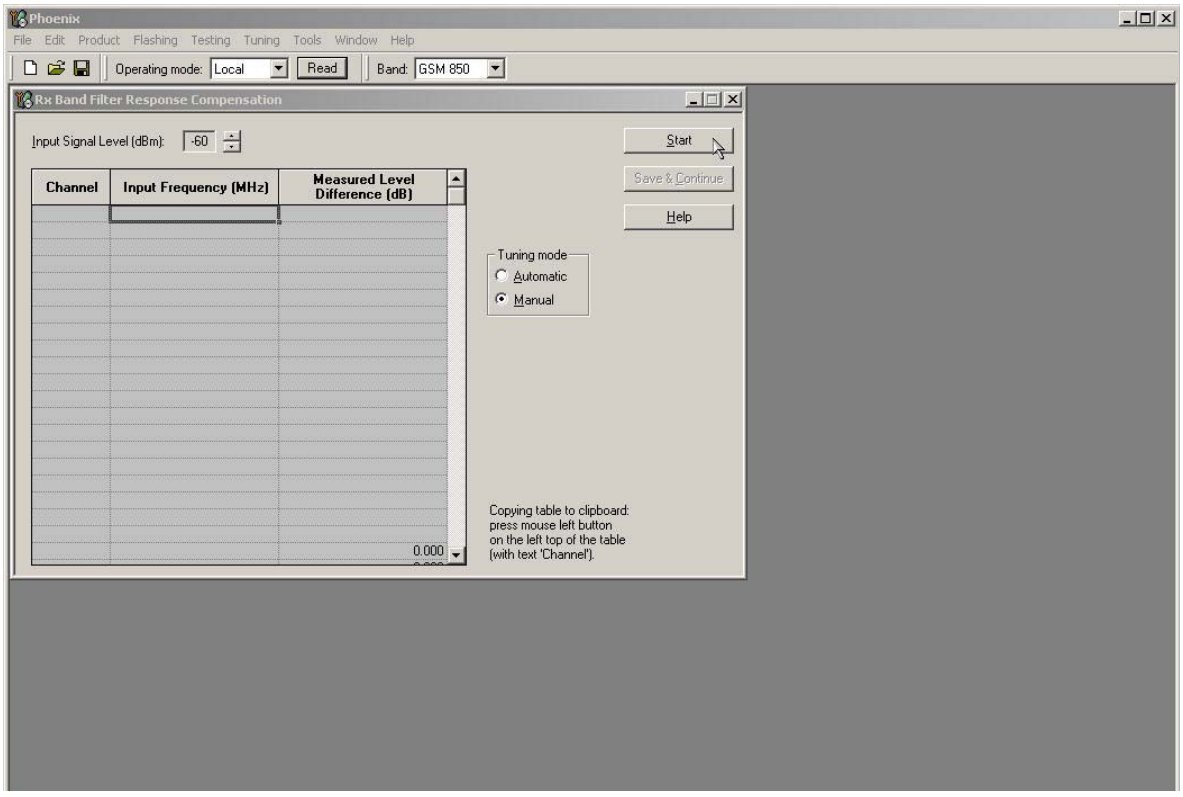
- Select → Rx Band Filter Response Compensation (Alt-C)

The necessary band selection is made by Phoenix automatically in the low band.

Press Start and the current "Level Differences (dB)" are loaded from the phone memory and displayed on the "Rx Band Filter Response Compensation" window.

The setup should now look like this:

Figure 9: RX Band Filter Compensation



- Connect an RF signal generator to the antenna port of the test jig respectively the phone.

If a radio communication tester (CMD 55, CMU 200, HP 8960, MT 8801) is used, assure that "continuous mode" is switched on and "modulation" switched off.

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Compensate for external RF cable and test jig losses.

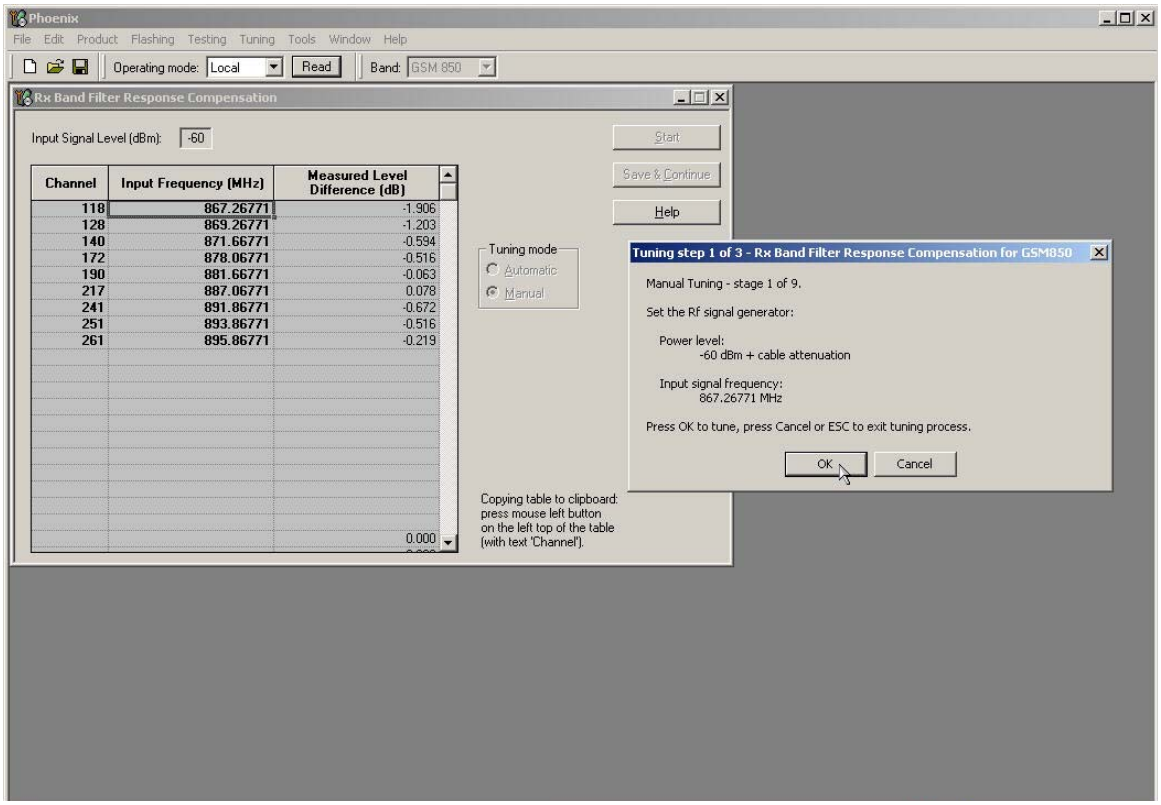
- Adjust the "Input signal Level (dBm)" field to -60 [dBm] on the "Rx Band Filter Response Compensation" window.

- Set the RF source as indicated in the pop- up window:
  1) Power Level: -60 dBm
  2) Frequency: 867.267710 MHz

- Press "OK".

The setup should now look like this:

Figure 10: RF Source Indication


Phoenix
File Edit Product Flashing Testing Tuning Tools Window Help
Operating mode: Local
Read
Band: GSM 850
Rx Band Filter Response Compensation
Input Signal Level (dBm): -60
Start
Save & Continue
Help
Channel | Input Frequency (MHz) | Measured Level Difference (dB)
118 867.26771 -1.906
128 869.26771 -1.203
140 871.66771 -0.594
172 878.06771 -0.516
190 881.66771 -0.063
217 887.06771 0.078
241 891.86771 -0.672
251 893.86771 -0.516
261 895.86771 -0.219
0.000
Tuning mode
Automatic
Manual
Copying table to clipboard: press mouse left button on the left top of the table (with text 'Channel').
Tuning step 1 of 3 - Rx Band Filter Response Compensation for GSM850
Manual Tuning - stage 1 of 9.
Set the RF signal generator:
Power level:
-60 dBm + cable attenuation
Input signal frequency:
867.26771 MHz
Press OK to tune, press Cancel or ESC to exit tuning process.
OK
Cancel

Follow the instructions for power level and signal frequency input for the remaining "Manual Tuning" stages 2 to 9 as indicated on the pop- up window.

- Press "OK" after each step.

- Press "Save and continue" to tune GSM1800 and GSM1900.

Autotuning

A faster and more comfortable method for Band Filter Calibration can be performed by automatic tuning. This requires an RF signal generator that can be

- Internally programmed for sweeping or

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- Externally controlled by a PC and a SW-program, e.g. HP Vee: Rx_AGC+Bandfilter_Cal.vee.

Open the window "Rx Band Filter Response Compensation" in Phoenix Service Software as follows:

- Select → Tuning (Alt-U)
- Select → Rx Band Filter Response Compensation (Alt-C)

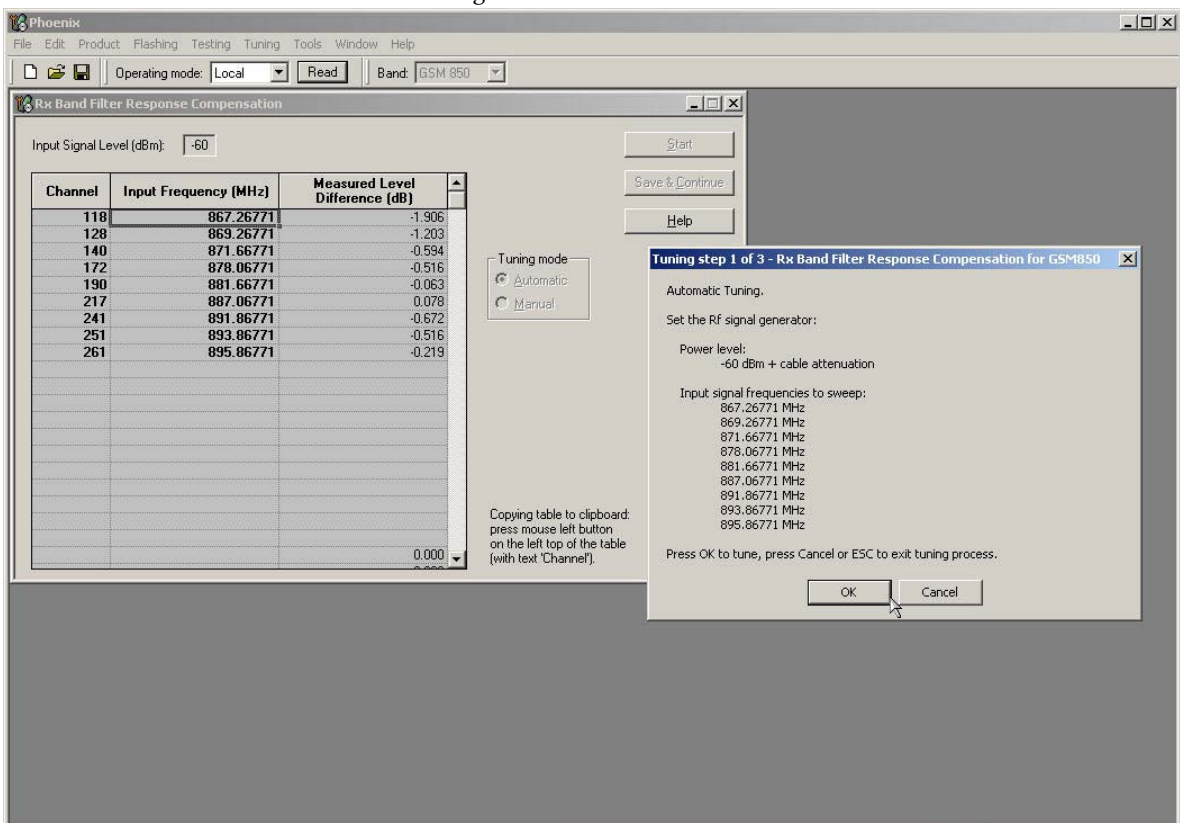
The necessary band selection is made by Phoenix automatically in the low band.

-Select **automatic** in the <Tuning mode> in the "Rx Band Filter Response Compensation" window.

- Press **Star**t and the current "Level Differences (dB)" are loaded from the phone memory and displayed on the "Rx Band Filter Response Compensation" window.

The setup should now look like this:

Figure 11: Level Differences



- Adjust the "Input signal Level (dBm]" field on the "Rx Band Filter Response Compensation" window to **-60 [dBm].**
- Set the RF signal generator to -60 dBm and program it according to the list of frequencies that is shown in the pop- up window "Rx Band Filter Response Compensation for GSM 850".

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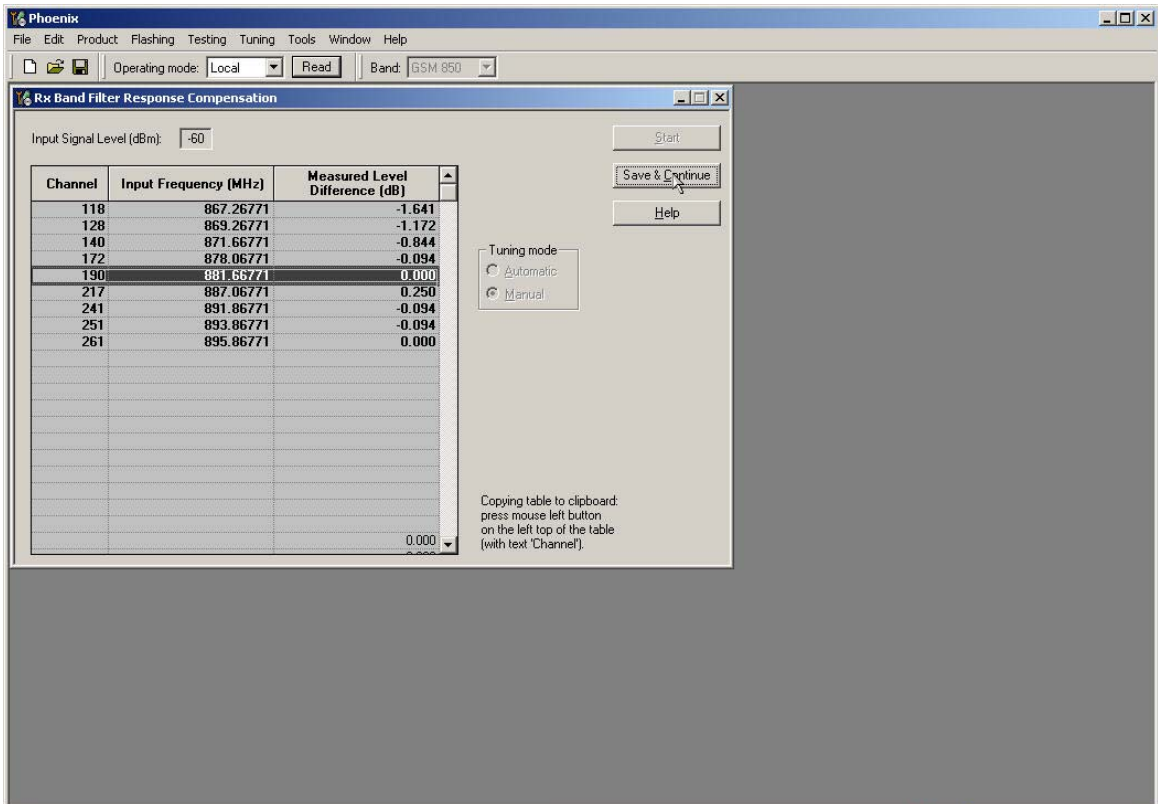
- Connect the RF signal generator to the antenna port of the test jig respectively the phone.

- Compensate for external RF cable and test jig losses.
- Press "OK".
- Press "Save and continue" to tune GSM1800 and GSM1900.

Limits

The typical value of the "Measured Level Difference (dB)" on channel 37 (middle of band) shall be approximately 0 dB.

Figure 12: Measured Level Differencer



Rx band filter response GSM 900, GSM 1800 and GSM 1900

The Rx Band Filter Response Calibration is identical for the other GSM 900, GSM 1800, GSM 1900 bands. So the instructions of chapter **Rx Band Filter Response GSM850** can be applied correspondingly**.** Frequency and channel designations vary correspondingly to the band selected according to the displayed windows in Phoenix.

The limits are valid for all GSM bands.

RX channel select filter calibration

In the following the calibration of the Rx Channel Select Filter (BB-filter) inside the RF-ASIC is described. It is performed by internal measuring of a proto-type filter. For this reason the calibration has to be done only once. No RF signal generator is needed.

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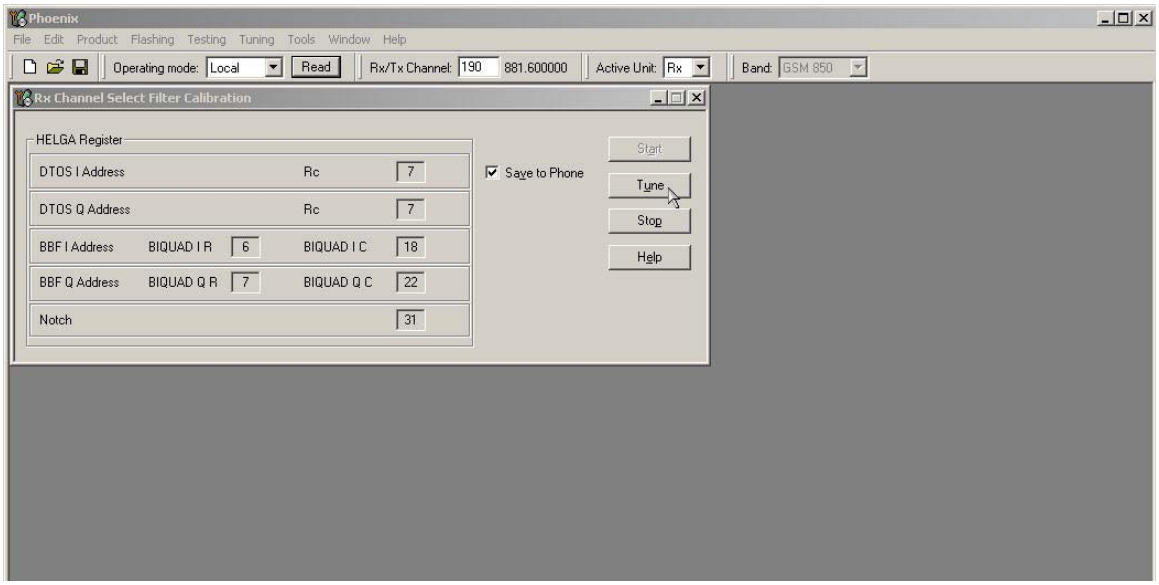
- Set operating mode to local mode.

- Select → Tuning (Alt-U)
- Select → Rx Channel Select Filter Calibration (Alt-H)

The setup should now look like this:

Figure 13: Channel Filter Calibration



- Press "Tune" and the optimal values are found.

- Press "Stop", the values are saved to the phone and the calibration has finished.

The results must fulfill the following limits:

Table 3: Calibration Values

Calibration value / Test case	Typical	Low limit	High limit
DTOS I Address Rc / check rx baseband filter DTOS_I [DAC]	21	-6	+37
DTOS Q Address Rc / check rx baseband filter DTOS_Q [DAC]	21	-6	+37
BBF I Address BIQUAD I R / check rx baseband filter BIQUAD_IR [DAC]	21	-6	+37
BBF I Address BIQUAD I C / check rx baseband filter BIQUAD_IC [DAC]	21	-6	+37
BBF Q Address BIQUAD Q R / check rx baseband filter BIQUAD_QR [DAC]	21	-6	+37
BBF Q Address BIQUAD Q C / check rx baseband filter BIQUAD_QC [DAC]	21	-6	+37

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Notch / check rx baseband filter NOTCH _ [DAC]	21	-6	+37

TX power level tuning

NPL-4 and NPL-5 support GMSK and EDGE mode for the Power amplifier.
Therefore the Power level tuning must be carried out for both modes in each band.It is strongly recommended to use **Phoenix Autotune** capability.

The functionality of Phoenix Autotune is described in chapter Fully automatic Calibration, Tuning & Measurement by Phoenix. Nevertheless manual tuning is described below.

This tuning must be done in all three bands. Note: TX Power Tuning must be done with a peak power meter, e.g. Anritsu model ML2408A with Anritsu Peak Power Sensor MA2442A and a suitable attenuator.

The use of the built-in power meter of GSM testers is likely to cause larger errors than the use of a dedicated power meter and might cause miss tuning so that the phone might be not compliant with the GSM specifications.

Set power supply voltage Vcc=3.9V !

Tx power level tuning GSM850, GSM900, GSM 1800 and GSM 1900 in GMSK mode

Tuning of GSM850, GSM900, GSM 1800 and GSM 1900 work in the same manner, only band settings are different.

-Start Phoenix Service Software and open FBUS connection.

-Select ->Scan Product (Ctrl-R)

Wait until phone information is shown in the lower right corner of the screen.

-Set operating mode to local mode.

-Select->Tuning->TX Power Level Tuning

Wait until the TX Power Level Tuning window is popped up.

Connect a **calibrated** power meter to the RF connector of the phone.

-Select->Load from->Permanent memory

-Select->Band->For example GSM850

Press " Start" and a window pops up:

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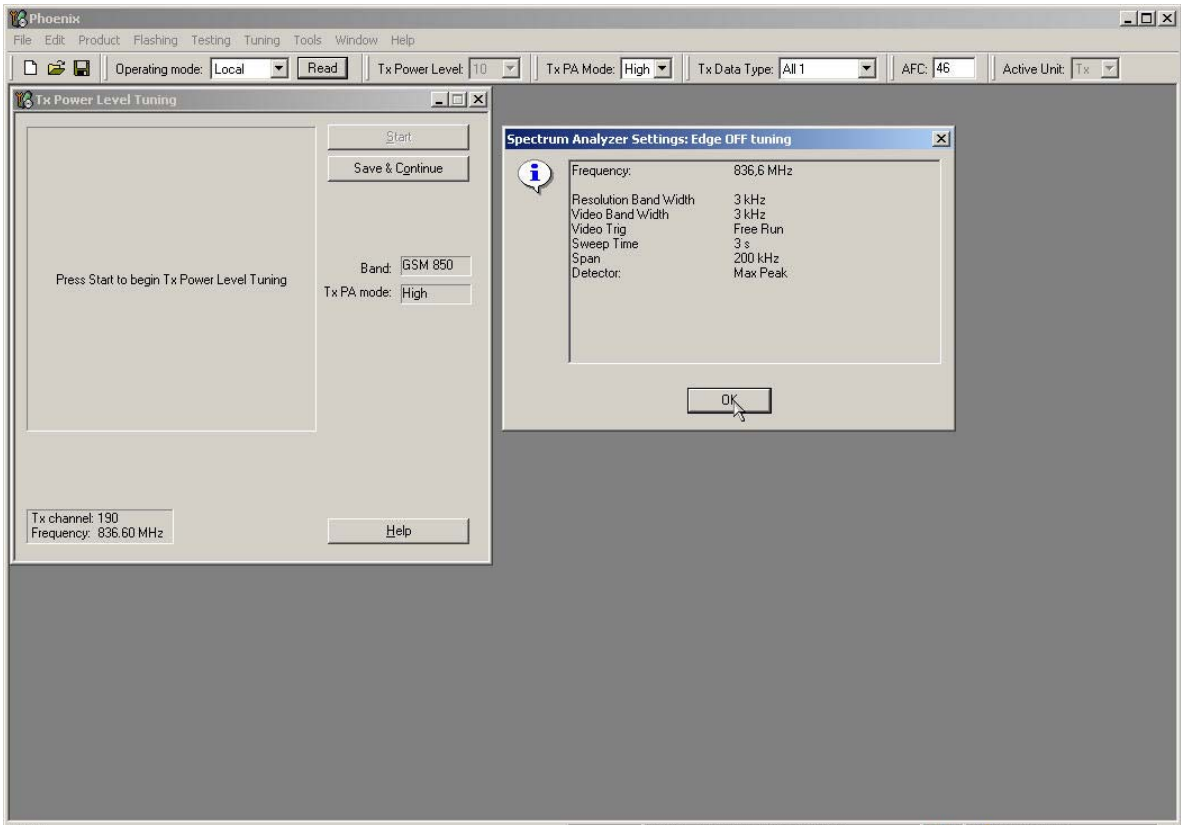
Figure 14: TX Power Level Tuning



-Select->TX Data Type->Random

Adjust DAC Values in TX PA mode 'High' for **bold** power levels according to target values:

Table 4: GSM850, GSM900

Power level	**Target power**		**Power level**	**Target power**
5	32.5 dBm		13	17 dBm
6	31 dBm		14	15 dBm
7	29 dBm		15	13 dBm
8	27 dBm		16	11 dBm
9	25 dBm		17	9 dBm
10	23 dBm		18	7 dBm
11	21 dBm		19	5 dBm
12	19 dBm		Base	-30 dBm

Table 5: GSM1800, GSM 1900

Power level	**Target power**		**Power level**	**Target power**

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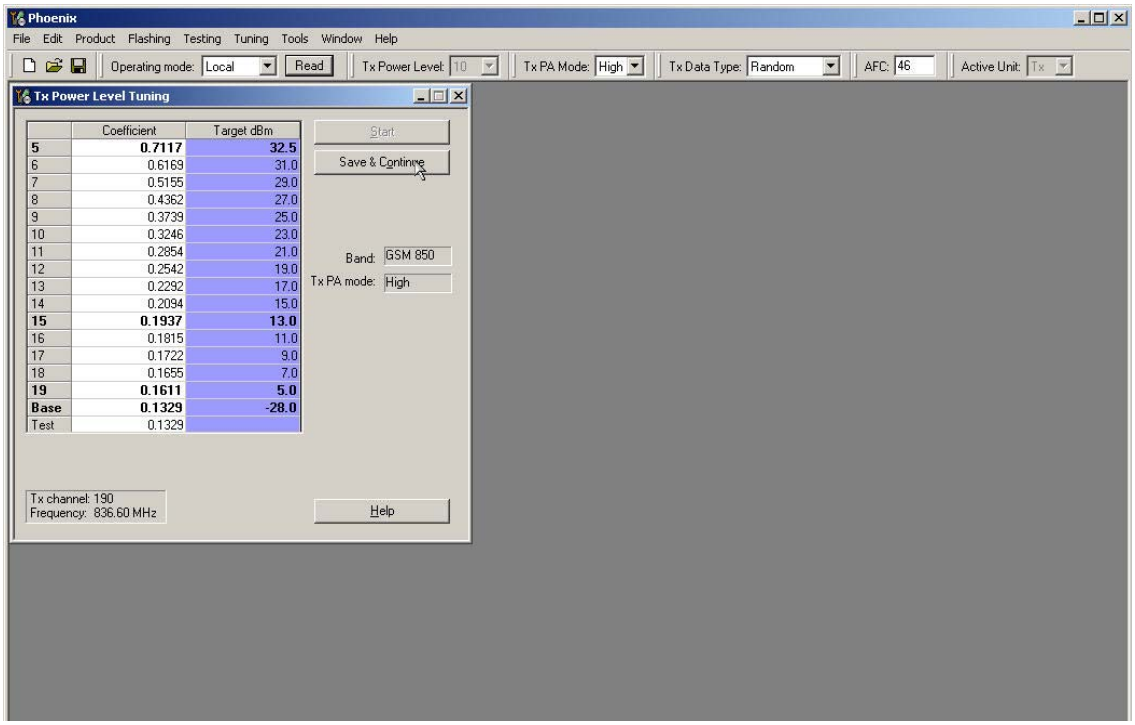
0	29.5 dBm		9	12 dBm
1	28 dBm		10	10 dBm
2	26 dBm		11	8 dBm
3	24 dBm		12	6 dBm
4	22 dBm		13	4 dBm
5	20 dBm		14	2 dBm
6	18 dBm		15	0 dBm
7	16 dBm		Base	-30 dBm
8	14 dBm			

The power levels may differ from the target power levels mentioned in Phoenix.

Make sure that the output power for maximum Power Level is equal or lower than 1dB below the saturation output power. Determine the saturation power by setting the DAC value to its maximum, for example, adjust the DAC Value to 32.3dBm for Power Level 5 if the saturation output power is only 33.3dBm.

The setup should now look like this:

Figure 15: TX Power Level Tuning



Check if all levels match the target values, correct if necessary.

-Select "Save and continue" to tune GSM850 in EDGE mode.

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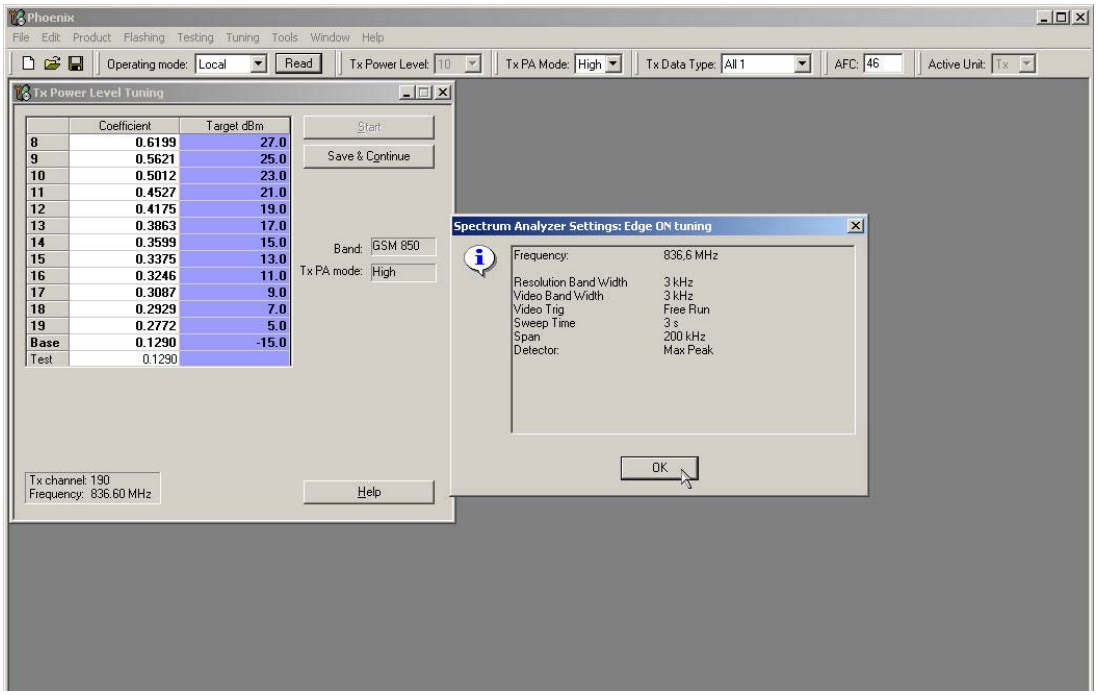
The setup should now look like this:

Figure 16: TX Power Level Tuning



- Select “TX data type” and then “Random”

- Press “OK” to tune

- Press “Save and continue” to tune GSM1800 and GSM1900

- Finish TX power level tuning closing the tuning window when all bands are tuned (also in EDGE mode).

Tx power level tuning GSM850, GSM900, GSM1800 and GSM1900 in EDGE mode

Adjust DAC Values in TX PA mode “High” for all power levels according to the target values:

Table 6: EGPRS850, EGPRS900

Power level	Target power		Power level	Target power
8	27 dBm		16	11 dBm
9	25 dBm		17	9 dBm
10	23 dBm		18	7 dBm
11	21 dBm		19	5 dBm

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12	19 dBm		Base	-15 dBm
13	17 dBm			
14	15 dBm			
15	13 dBm			

Table 7: EGPRS1800, EGPRS1900

Power level	Target power		Power level	Target power
2	26 dBm		10	10 dBm
3	24 dBm		11	8 dBm
4	22 dBm		12	6 dBm
5	20 dBm		13	4 dBm
6	18 dBm		14	2 dBm
7	16 dBm		15	0 dBm
8	14 dBm		Base	-15 dBm
9	12 dBm			

The power levels may differ from the target power levels mentioned in Phoenix.

Make sure that the output power for maximum Power Level is equal or lower than 1dB below the saturation output power. Determine the saturation power by setting the DAC value to its maximum, for example, adjust the DAC Value to 27 dBm for Power Level 8 if the saturation output power is only 28 dBm.

TX I/Q tuning

This tuning must be performed in all three bands in GMSK or EDGE mode

The tuning is carried out exactly the same way in each band and is therefore described only once

Set supply voltage to 3.9V.

-Start Phoenix Service Software and open FBUS connection.

-Select->Scan Product (Ctrl-R)

Wait until phone information is shown in the lower right corner of the screen.

-Set operating mode to local mode.

-Select->Tuning->TX IQ Tuning

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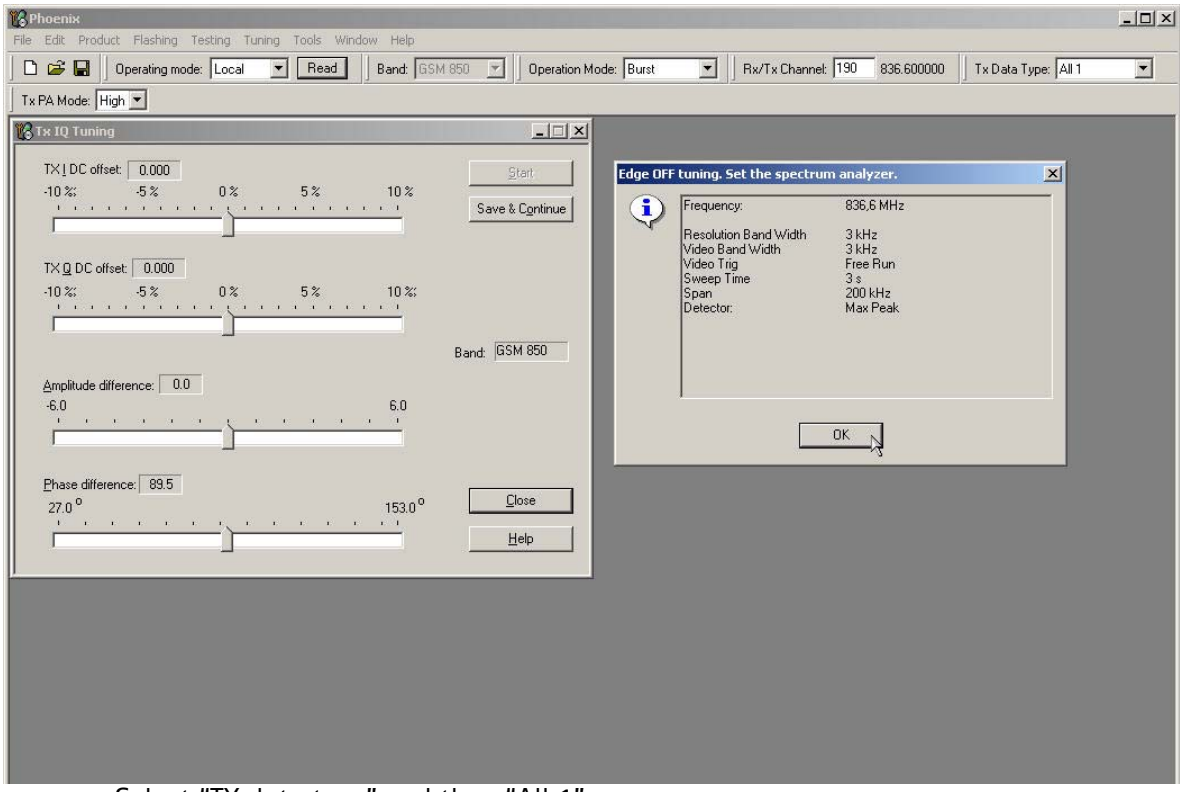
Wait until the TX/IQ window is popped up:

Figure 17: TX IQ Tuning



- Select "TX data type" and then "All 1".

Connect a Spectrum Analyzer or GSM tester with the option "Narrow Spectrum" to the antenna pads of the phone.

If a spectrum analyzer is used, make the following settings, adjust "Center frequency" and "Markers" according to bands.

	GSM900
Center Frequency	897.4 MHz
Frequency Span	300 kHz
Resolution Bandwidth	3kHz
Video Bandwidth	3kHz
Sweep Time	3 sec.
Sweep Type	Clear/Write
Detector Type	Max Peak
Reference level	35 dBm
Marker 1	897.33229 MHz

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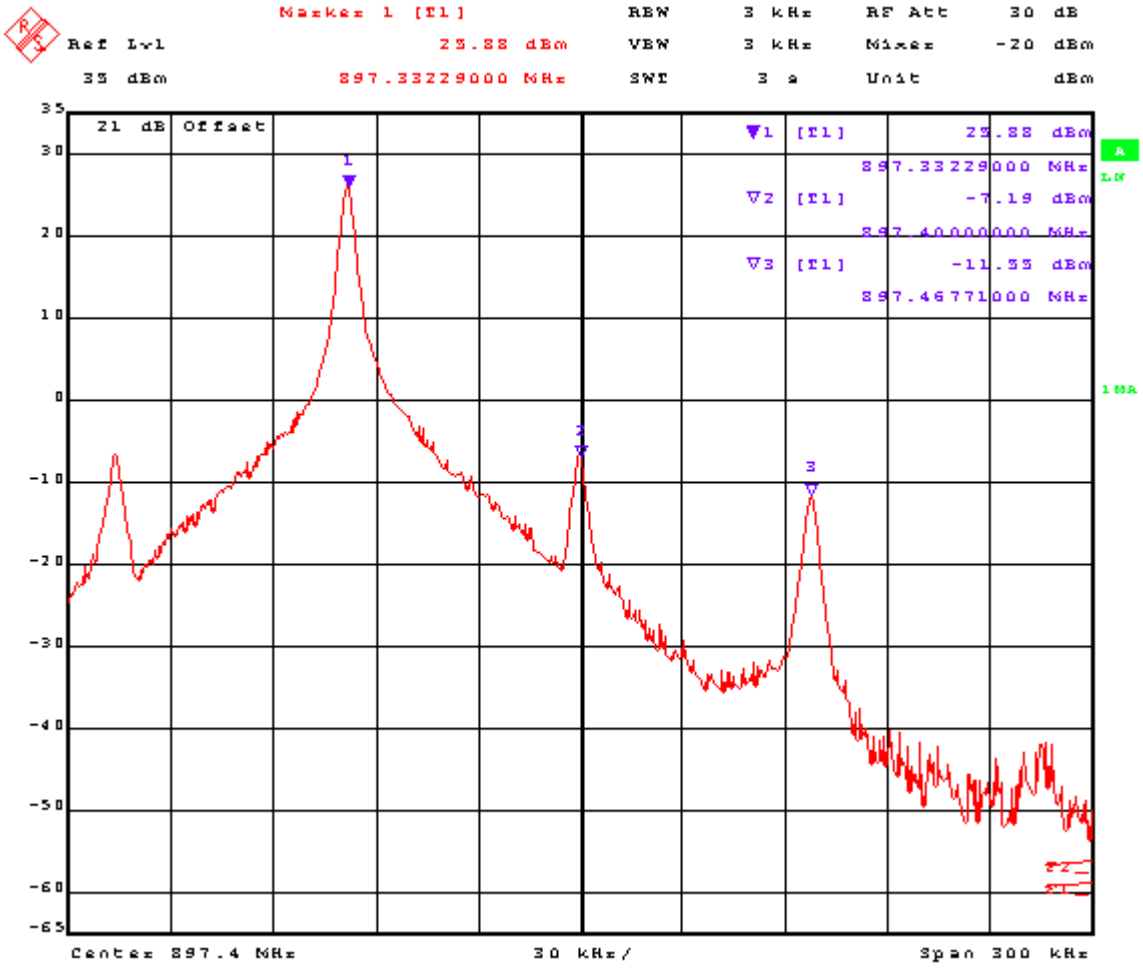
Marker 2	897.4 MHz
Marker 3	897.46771 MHz

The Spectrum Analyzer now shows a diagram like this:

Figure 18: Spectrum Analyser



The purpose of this alignment is to tune the carrier signal (at marker 2) and the +67kHz signal (at marker 3) to a minimum level.

Use the variables "TX I DC offset" and "TX Q DC offset" to adjust the carrier signal to a minimum level (marker 2). Tuning can be performed by using arrow keys on the keyboard. Pushing the sliders by using the mouse is less sensitive however possible.

After tuning to the minimum the level difference between marker 2 and the peak levels at marker 1 must exceed 40dB.

The Spectrum Analyzer now shows a diagram like this:

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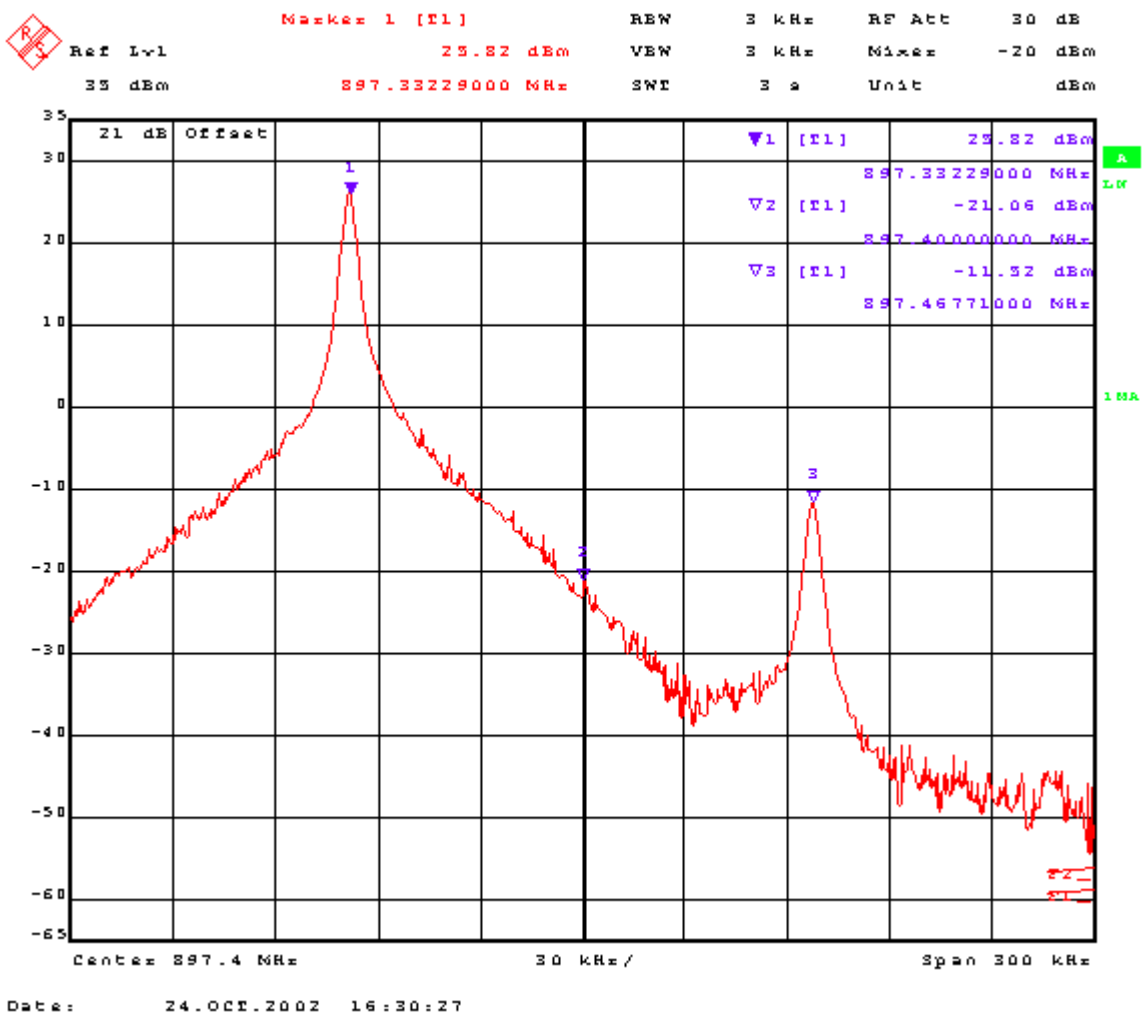
Figure 19: Spectrum Analyser



Use the variables "Amplitude difference" and "Phase difference" to adjust the +67kHz signal to a minimum level (Marker 3). Tuning can be performed by using the arrow keys on the keyboard. Pushing the sliders by using the mouse is less sensitive however possible.

After tuning to the minimum the level difference between marker 3 and the peak level at marker 1 must exceed 40dB.

The Spectrum Analyzer now shows a diagram like this:

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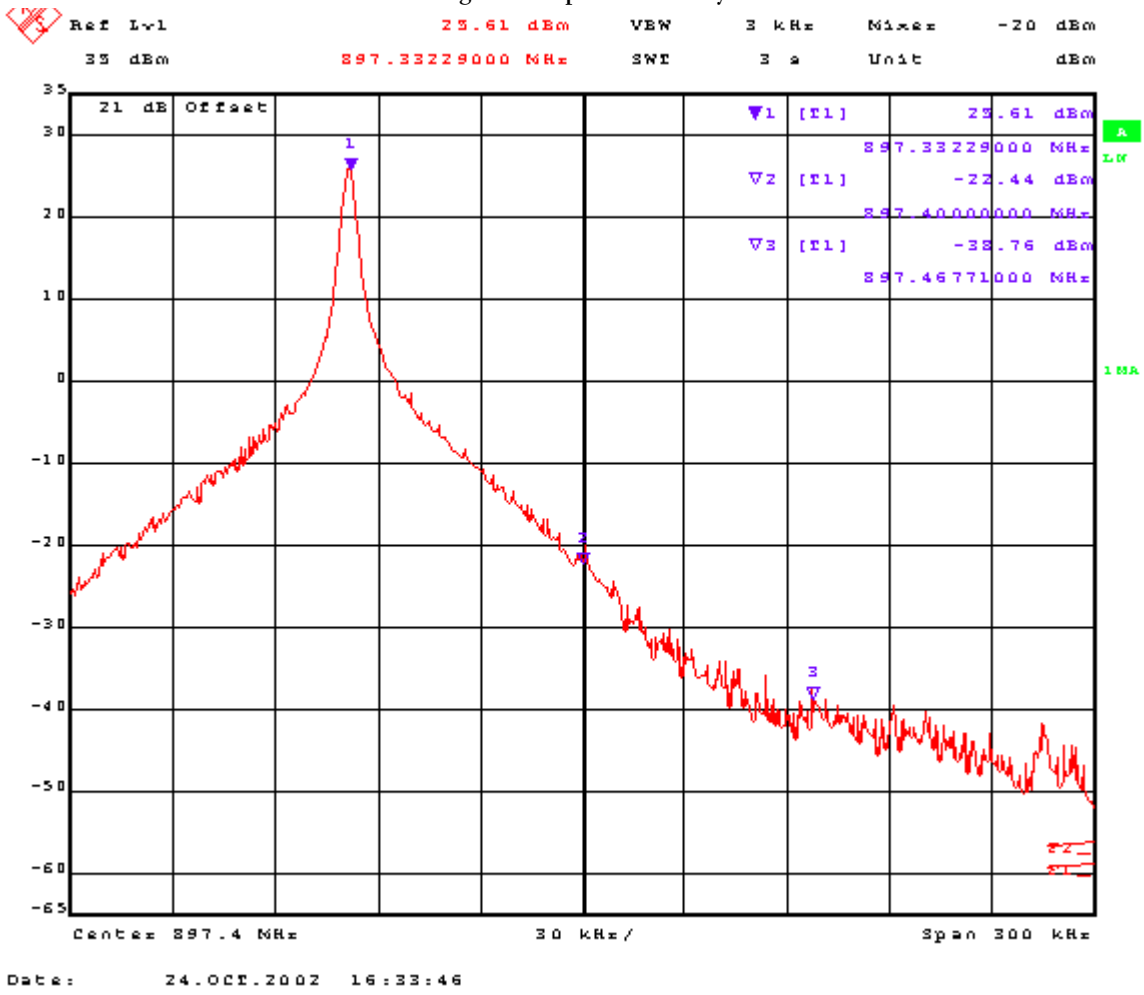
Figure 20: Spectrum Analyser



Compare the results in the TX IQ Tuning Window with the limits below:

Table 8: Limit Values

Value	Typical	Limit min.	Limit max.
TX I DC offset	0	-6	6
TX Q DC offset	0	-6	6
Amplitude difference	0	-1	1
Phase difference	90	80	100

The setup should now look like this:

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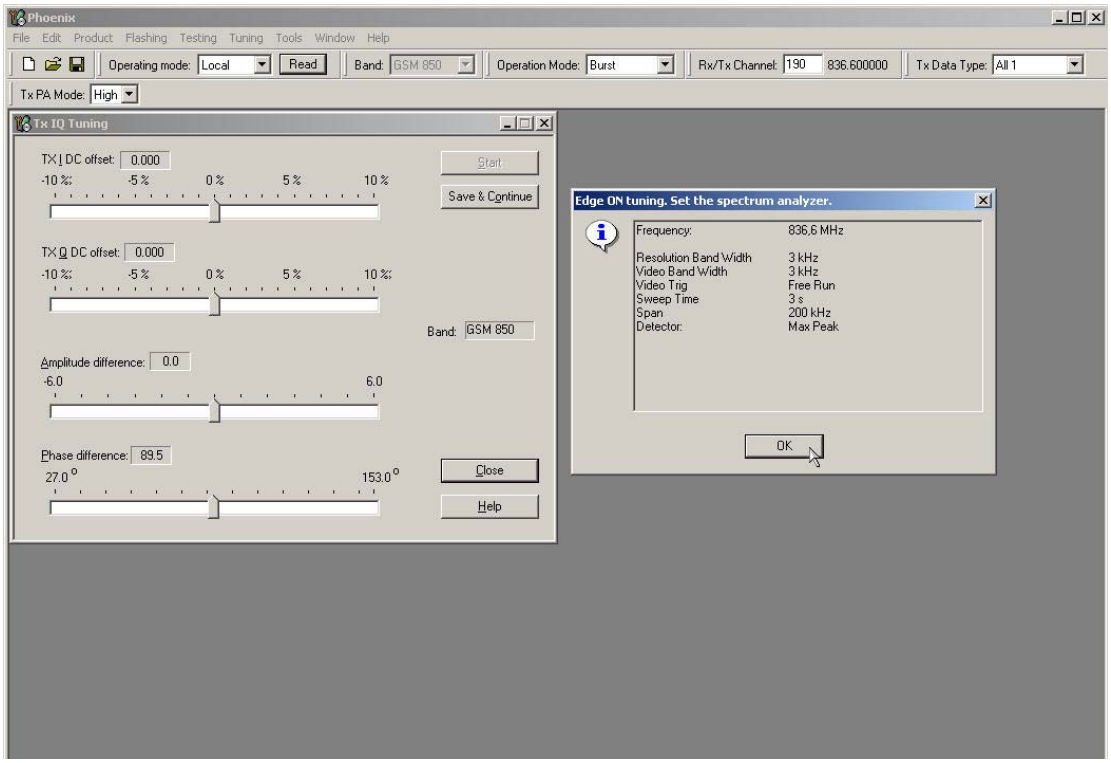
Figure 21: TX IQ Tuning



- Press "Save and continue" to tune GSM850 in EDGE mode

-Continue until all bands are tuned, also in EDGE mode.

Note: The optimum values for "TX I and Q Offset" and "Amplitude and Phase Difference" vary from phone to phone

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Fully Automatic Calibration, Tuning & Measurement by Phoenix "Auto-Tune"

Auto-tune is designed to align the phone' s RF part easier and faster, it calibrates, tunes and measures the following for NPL-4 and NPL-5:

- Rx channel select filter calibration
- Rx calibration
- RX band filter response compensation
- RX Dtos balance calibration
- Rx AM suppression
- Tx power level tuning
- Tx I/Q tuning

and saves the results in a log-file, if wanted

Preparations for Phoenix

Copy the ini-file: autotune_NPL-4.ini, autotune_NPL-5.ini to the root directory of Phoenix. Follow the general instructions for tuning in chapter Phoenix tuning.

Compensation of cable and jig losses

Measure the losses of the feeding cable(s) between the phone and the Radio Communication Tester respective the network consisting of RF generator and Signal Analyzer. The set up of the measurement equipment and its cabling are shown in the HELP-program Environment.

-Follow the path: Tuning → Auto-Tune → Help → Environment)

Note: Only the proposed measurement equipment listed in <Environment> is supported.

Selection of measurement equipment:

-one Tx and one Rx measurement equipment each from the Tx and Rx lists

or

-one from the Rx/Tx list (only Rohde & Schwarz CMU 200 currently supported)

No mixing of equipment from the lists [Rx/Tx] and [Tx or Rx] allowed. This means the use of CMU 200 allows no other measurement equipment !

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The discrete frequencies for loss determinations are defined in the Phoenix software.

To change attenuation values in Settloss table PKD-1NS dongle is needed.

GPIB interface

The GPIB card is labeled by National Instruments or at least compatible with their products.

Drivers must be installed and card <accepted> by Phoenix. The following procedure has to be made once for "acceptance":

-Select->Tools (Alt-T)

Options (Alt-O)

GPIB card (Alt-G)

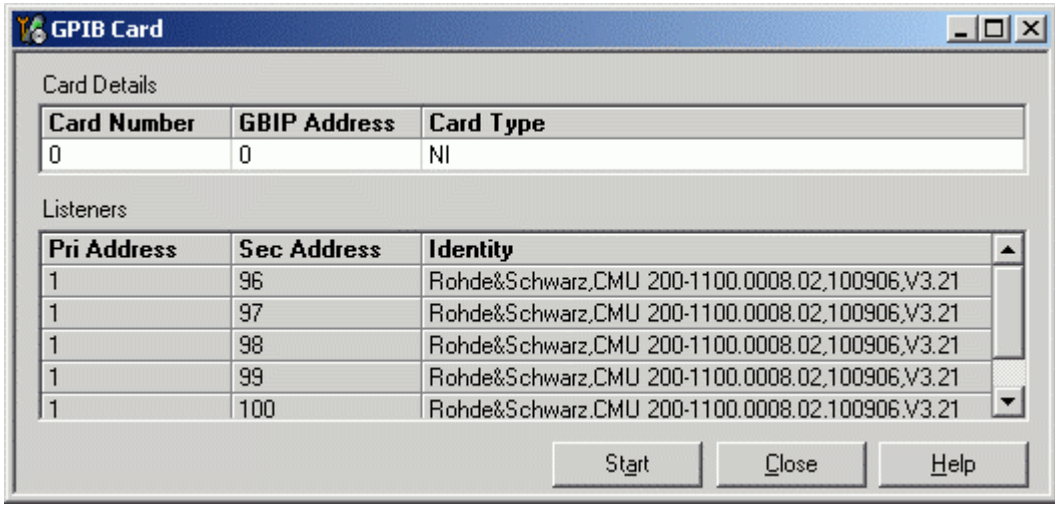
The window "GPIB Card" pops up.

-Select ->Card Type: NI

Press "Start" and wait until the "listeners" are identified, then press "Close".

The set up should now look like this:

Figure 22: GPIB Card



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Automatic tuning procedure

-Select Tuning (Alt-U)

Auto-Tune (Alt-A)

Tune (Alt-T)

Log file

To enable the creation of a log file to save the calibration, tuning and measurement results edit the command of the <autotune_NPL-4.ini> file as follows:

Row 8: Logging **1**

Additional the path for the logging file can be defined in row 9. Delete the character <;> at the beginning of the row to enable the command. Otherwise the log-files will be written to the directory\text-file:

-Phoenix\Products\NPL-4\autotune_results_yymmdd_hhmmss.txt

The file gets an explicit time stamp for identification and sorting:

-yy=year, mm=month, dd=day hh=hour, mm=minute, ss=second

For NPL-5 the corresponding notes are valid.

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Service Tool Concept For Baseband Tuning Operations

EM calibrations should be carried out in JBV-1 Docking Station equipped with MJF-27 Docking Station Adapter.

Note: RF tunings must be carried out in MJ-9 module jig.

MJF-27-Docking Station Adapter can only be used for RF testing purposes.

Power to JBV-1 should be supplied from an extarnal DC power supply, not FPS-8 prommer.

JBV-1 input voltages:

Maximum + 16 VDC

Nominal input for BB tunings is +12 V DC

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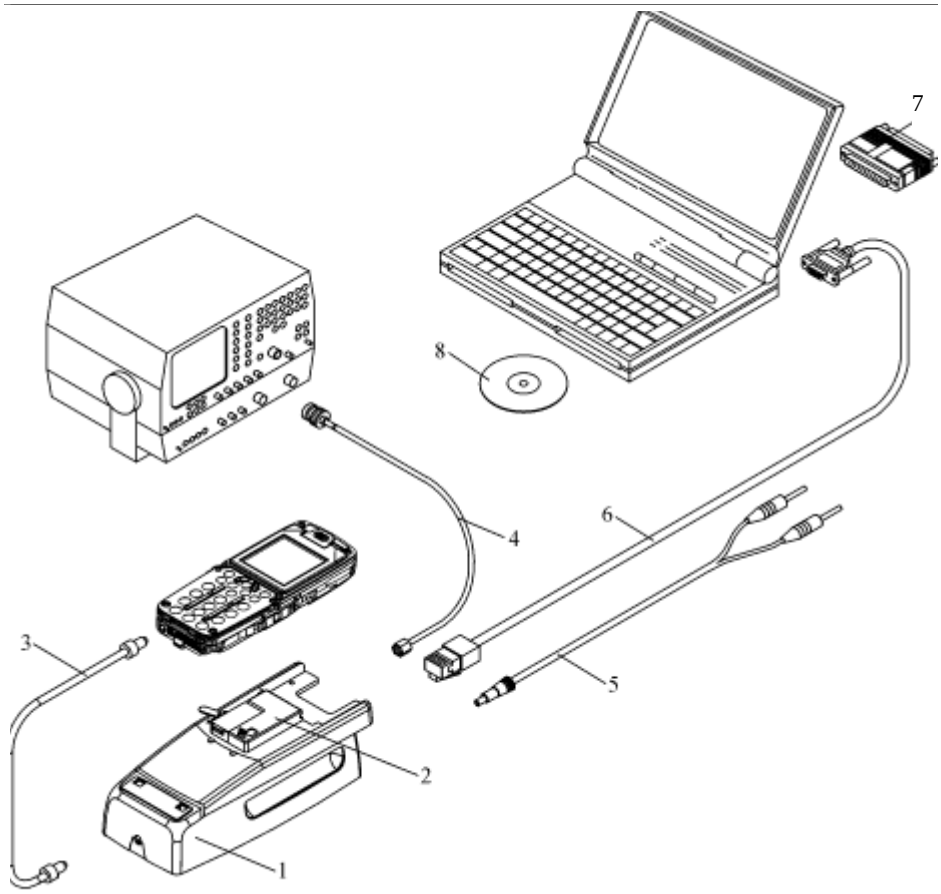
Service concept for NPL-4/5 baseband tunings and RF testing



Note! No RF tuning allowed with RF coupler!

Item	Accessory type	Service Accessory	Product code
1	JBV-1	Docking Station	0770298
2	DA-7	Docking adapter	0770708
3	SCB-3	DC-DC Cable	0730114
OR	CA-5S		0730283
4	XRF-1	RF antenna cable	0730085
5	PCS-1	DC power cable	0730012
6	DAU-9S	Service MBUS cable	0730108
7	PKD-1	Software protection key	0750018
8		Phoenix service SW	8409031
8	CD-ROM	Phoenix service SW	0774286

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Baseband Tuning operations

Energy management tuning

External power supply needed.

EM Calibration is used for calibrating Battery and Charger settings of the phone.

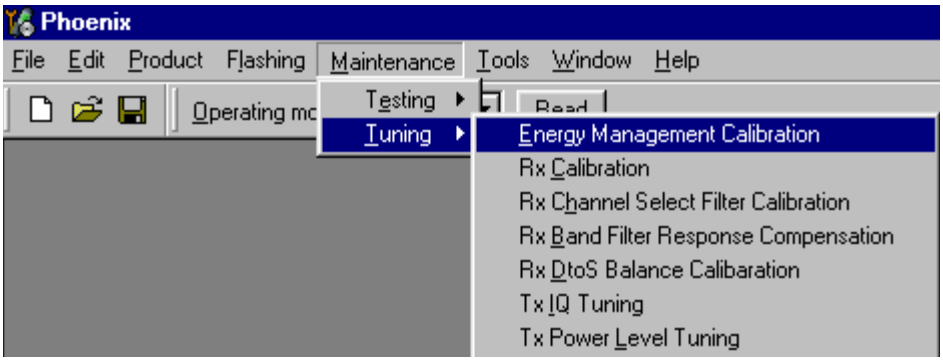
Preparation for EM Calibration:

- Connect DC Cable SCB-3 between JBV-1 and Vin of Phone for Charger calibration

- Connect 12...15 V from Power Supply to JBV-1

- NOTE! Check that connection is F-BUS (does not work with M-BUS!)

Select Maintenance->Tuning-> Energy Management Calibration.



Energy Management values to be calibrated are checked.

Select "Read from Phone" to show the current values in the phone memory and to check that the communication with the phone works.

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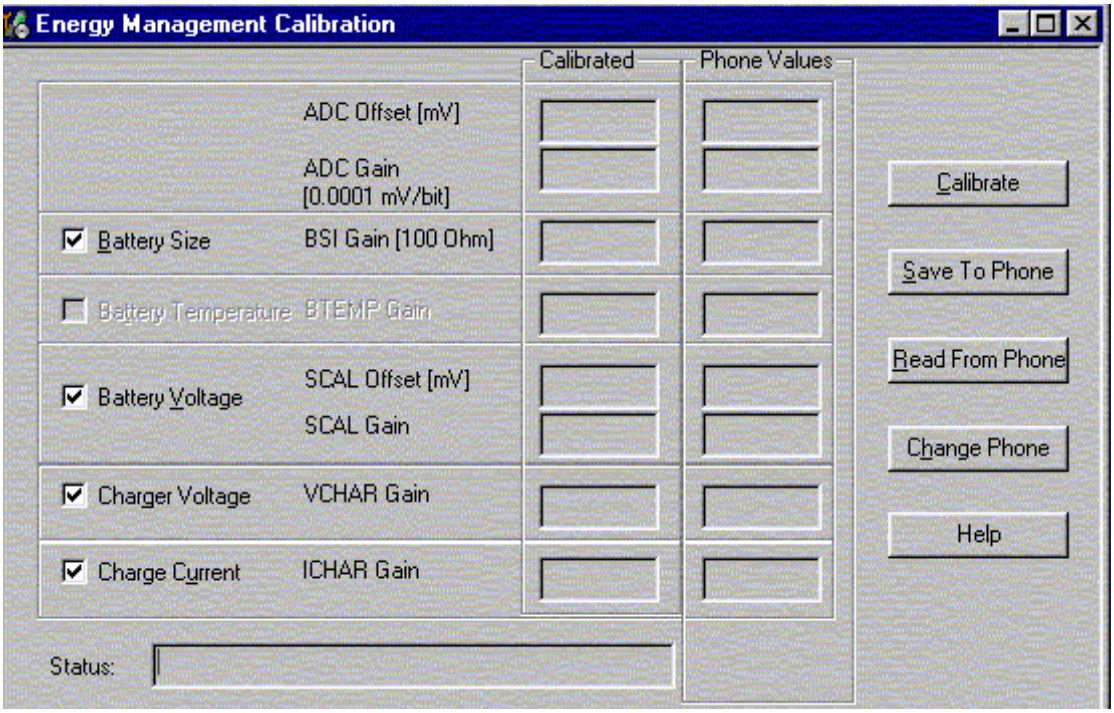
Select "Calibrate" to run the selected calibrations.



Limits for Energy Management Calibration:

Parameter	Min.	Max	Note
ADC gain	25400	29000	VBatt, BSI, BTemp
DC offset	-50	50	ADC voltage offset
BSI gain	970	1100	ADC BSI calibration gain
VBAT gain	10000	11000	ADC VBATT Voltage gain
VBAT offset	2300	2900	ADC VBATT Voltage offset scale
VCHAR	55000	65000	Charge voltage
ICHAR	3800	4800	Charge current gain
ICHAR offset	-50	50	Charge current offset

If values shown are within limits select "Save To Phone" to save the values in the phone.

NOTE! Only the values of the checked tunings (Battery size, Battery Temperature etc.) are saved.

Close the "Energy Management Calibration" – dialog to end tuning.

You must manually switch the phone on after exiting "Energy Management Calibration" – dialog.

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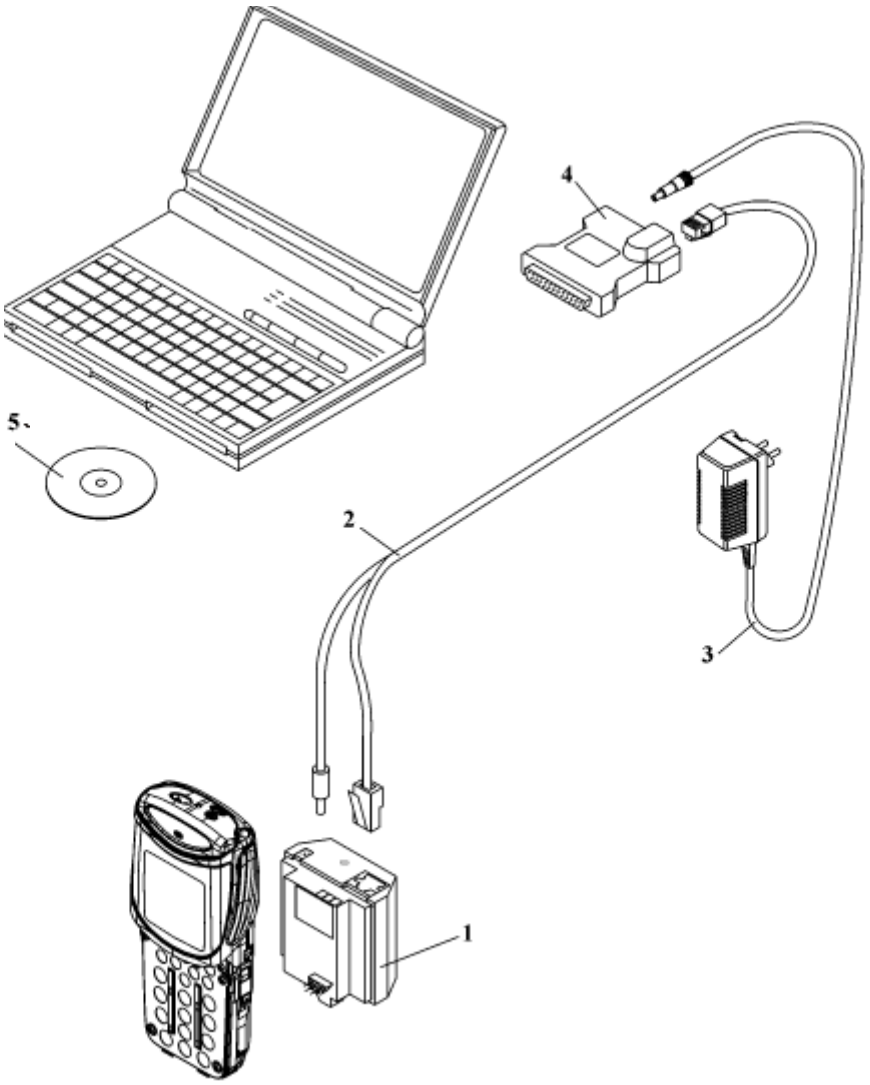
Flashing Setup Instructions

POS (Point of Sales) flash concept

Figure 23: POS flash



Item	Type	Description	Code
1	SF-6	POS Flash Adapter	0770709
2	XCS-1	service cable	0730218
3	ACP-12	AC Charger	0675***
4	FLS-4S	POS flash dongle, for E/A area	0080541
	FLS-4S	POS flash dongle, for APAC area	0080542
5	SW	Phoenix Sales Package	xxxxxxx

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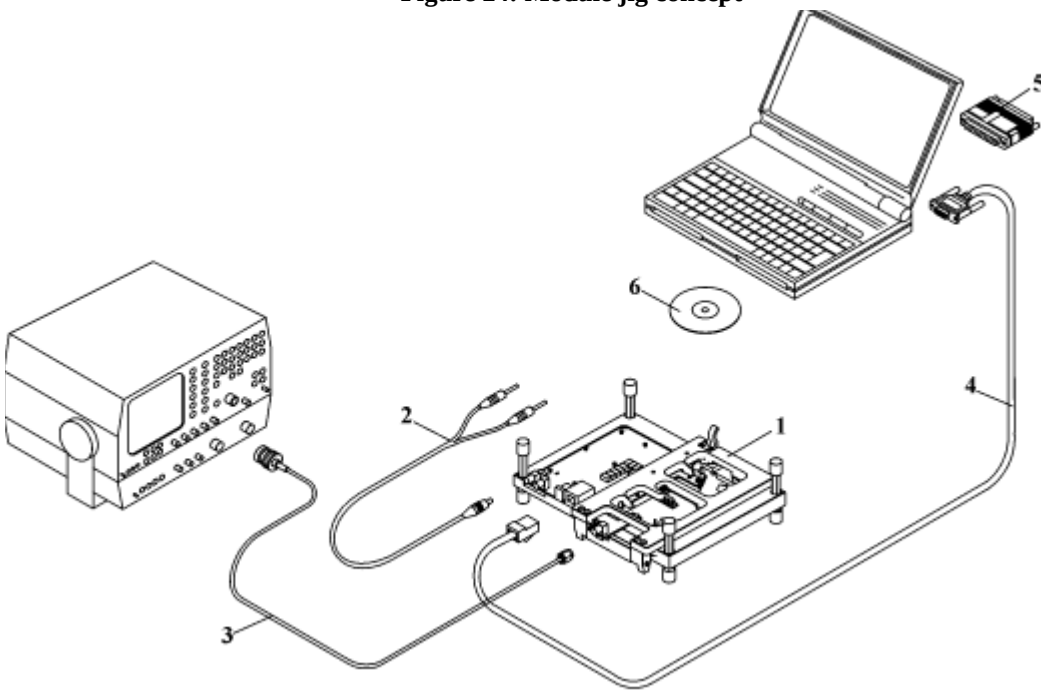
Module jig concept

Note! For RF tuning and testing.

Figure 24: Module jig concept



Item	Type	Description	Code
1	MJ-9	Module jig	0770707
2	PCS-1	DC power cable	0730012
3	XRF-1	RF antenna cable	0730085
4	DAU-9S	Service MBUS cable	0730108
5	PKD-1	Software protection key	0750018
6	SW	Phoenix Sales Package	xxxxxxx

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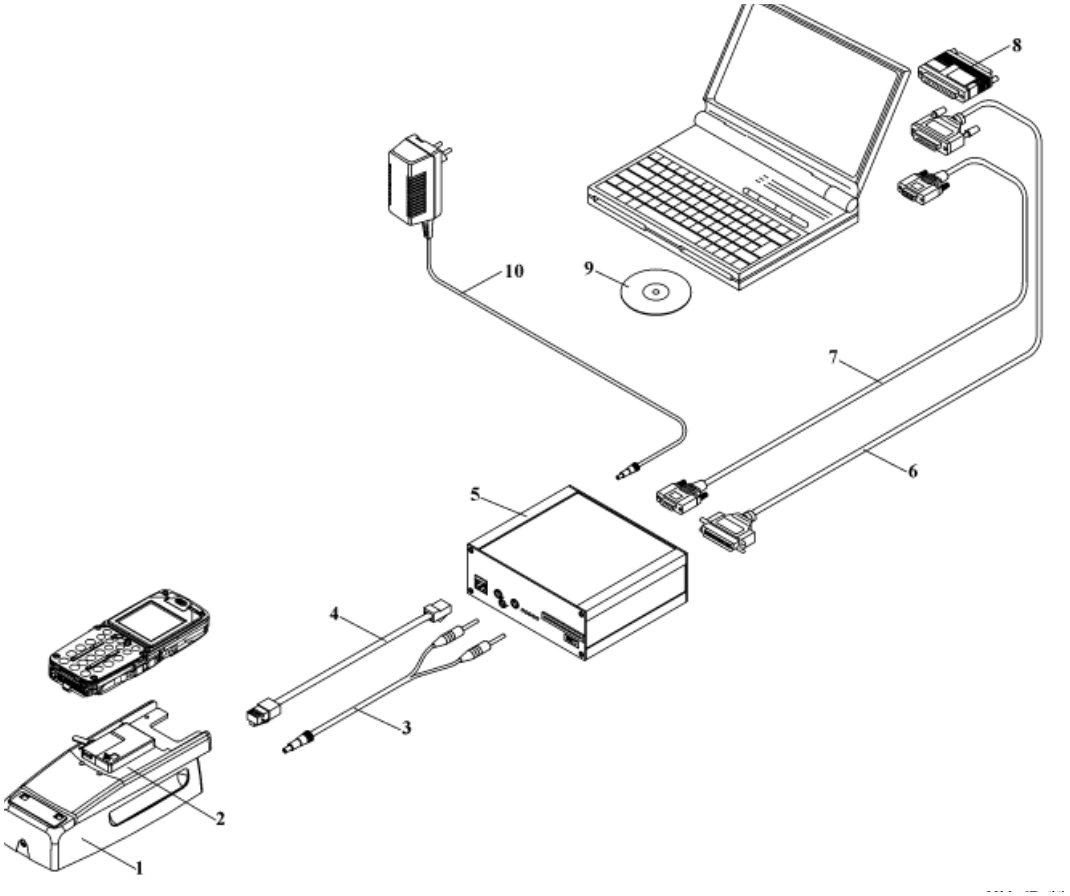
JBV-1 flash concept

Note! Instead of JBV-1 + DA-7, flashing can be performed with MJ-9 Module jig.

Figure 25: JBV-1 Flash concept



Item	Type	Description	Code
1	JBV-1	Docking station	0770298
2	DA-7	Docking adapter	0770708
3	PCS-1	DC power cable	0730012
4	XCS-4	Modular cable	0730178
5	FPS-8	Flash prommer box	0080321
6	Printer cable	incl. in FPS-8 sales pack	0730029
7	AXS-4	D9 – D9 cable, incl. in FPS-8 sales pack	0730090
8	PKD-1	Software protection key	0750018
9	Service SW	Phoenix Sales Package	xxxxxxx
10	AC Charger	incl. in FPS-8 sales pack	0680032

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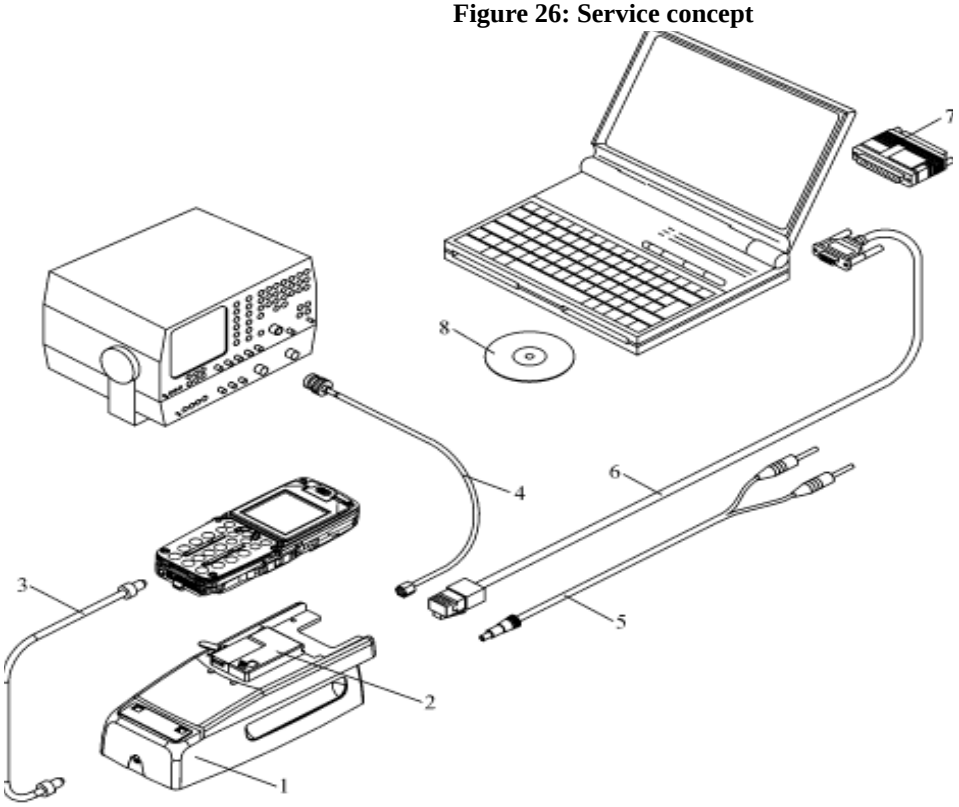
JBV-1 Service concept

Note! For RF testing and BB tuning. No RF tuning allowed.

Figure 26: Service concept



Item:	Type:	Service accessory:	Product code:
1	JBV-1	Docking station	0770298
2	DA-7	Docking adapter	0770708
3	SCB-3	DC-DC cable	0730114
OR	CA-5S		0730283
4	XRF-1	RF antenna cable	0730085
5	PCS-1	DC power cable	0730012
6	DAU-9S	Service MBUS cable	0730108
7	PKD-1	Software protection key	0750018
8	Phoenix Sales Package	Phoenix Service SW	0774286
	CD-ROM	Phoenix Service SW	0775311
		NPL-4/5 Flash SW data	8419181
	CD-ROM	NPL-4/5 Flash SW data	0770644

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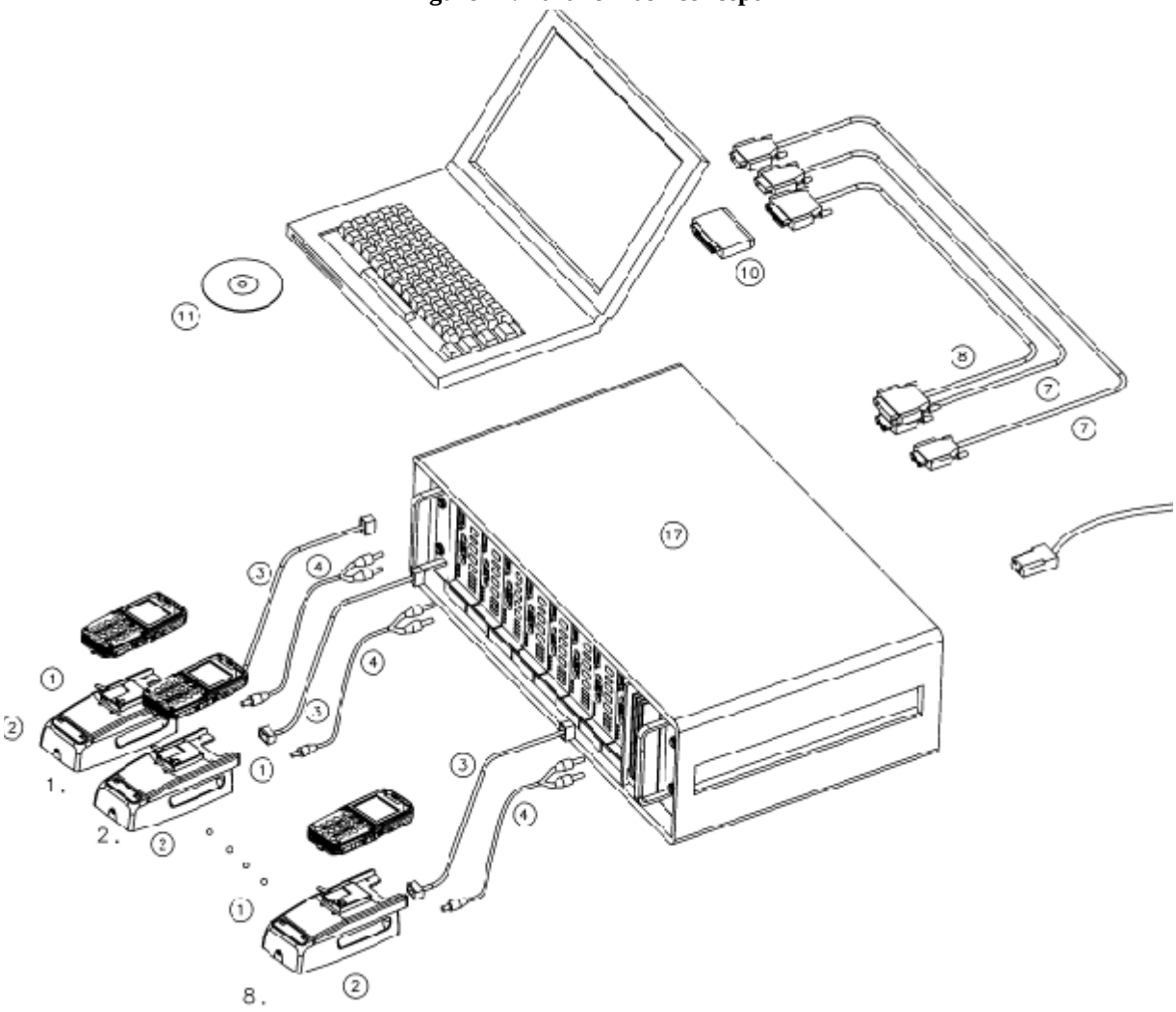
Parallel flash concept

Figure 27: Parallel flash concept



Item	Type	Description	Code
1	DA-7	Docking adapter	0770708
2	JBV-1	Docking station	0770298
3	XCS-4	Modular cable	0730178
4	PCS-1	DC power cable	0730012
7	AXS-4	D9 – D9 cable, incl. in FPS-8*/FPS-8C sales pack	0730090
8	Printer cable	Incl. in FPS-8*/FPS-8C sales pack	0730029
10	PKD-1	Software protection key	0750018
11	SW	Software (PC SW + SF11C SW)	
17	FPS-8*/FPS-8C		0080396

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